KNOWLEDGE
AN
ILLUSTRATED MAGAZINE
OF
SCIENCE, LITERATURE, & ART

LONDON: MAY 1, 1886.

THE UNKNOWABLE.

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WORSHIP OF THE PLANETS.

WITH the progress of time, it became clear to the worshippers of the sun and moon, that these orbs moved around the star-sphere according to definite laws. The idea might still remain that unless due prayers and sacrifices were offered up to each of them, they might be offended, and cease either for a while, or for ever, to pursue their proper circuits. But inevitably the thought would intrude that the sun and the moon were sure to move as they had been wont to do since men had first observed them, and that it was idle to pray for what was sure to take place. For uncertainty is a necessary element in prayer. Those who deem it right, nay, a duty, to pray for fine weather after long rains, or for rains after long drought, would not think of praying that the sun should rise to-morrow or ascend to his due height in the heavens as the year progresses; nor would they pray that he should stand still or in any other way behave as they know he never has behaved and never can. We can not only see from the sacrifices offered at the time of new moon, sunrise, sunset, and still more solemnly at the spring equinox and the autumn equinox, that in old times men thought it was worth while to try to keep the sun and moon in their proper courses by duly propitiating those heavenly bodies, but we know that so ignorant were they of the laws of the celestial movements, that they did not hesitate to pray the sun and moon *not* to move in their proper courses. As that exceedingly religious rhyme-writer, Robert Montgomery, did not hesitate to invite Deity to "Pause and think," so the medicine men of olden times were ready to request the sun and the moon to stand still, and either persuaded themselves, or tried to persuade others, that on occasions even such bold prayers as this had been answered. But though the earth-central idea left men freer to imagine such marvels to be possible than men can be in our time (except, of course, the ignorant) even the observant believer in the earth-central theory must early have become conscious that the sun and the moon move according to regular law, and will neither hasten nor check their movements in response to prayers or sacrifices.

No doubt most men in those days regarded such ideas as profane and blasphemous. As fossil-minded folk in our days proclaim that science is setting on one side the Almighty in the name of universal evolution, so would the ignorant of those old sun-worshipping and moon-worshipping days have lamented that their gods were being set aside in the name of uniform motion. We have only to consider the horror with which the Copernican theory and afterwards the theory of gravitation were received, to perceive what a shock there must have been for the worshippers of the sun and moon in the idea that these bodies have, each of them, their appointed paths.

But in the meantime other orbs would have attracted the attention of those persons—priests, astronomers, or whatsoever we may call them—who attended to the movements of the sun and moon, determining the times and seasons for sacrifices and for all other ceremonial observances. They found five other bodies travelling along the zodiacal track, already recognised as the highway of the gods.

Jupiter and Mars must first have been distinguished from the fixed stars by their movements, though Venus certainly attracted attention earlier by her lustre and her alternate appearance on either side of their great god, the sun. Even Mercury may have been noticed as a strangely moving body—never seen except near the sun, and passing rapidly from one side to the other—before Mars and Jupiter were distinguished from the fixed stars. We, indeed, seldom see Mercury at all, and never see him as a conspicuous orb; but in clearer and less humid skies than ours Mercury shines out resplendently, well justifying the name given to him by the ancient astronomers—the Sparkling One.

It may probably have been a long time before either Venus or Mercury was recognised as traversing the zodiacal track, which had been assigned to the sun and moon. On the contrary, Jupiter and Mars, so soon as they were distinguished at all from the fixed stars, would be seen to have the zodiac for their pathway. Later, Saturn would be distinguished as a planet, though it might be hard to determine whether he was probably first recognised as such through his movements or through the peculiar quality of his light, which distinguishes him in marked degree from the fixed stars.

So soon as the five planets had been recognised—one may almost say discovered—the priestly observers could not fail to regard those bodies as deities, like the sun and moon, as beings therefore to be propitiated by prayer and sacrifice. It was not merely as Wordsworth rather mildly puts it, that these "radiant Mercuries seemed to move, carrying through æther, in perpetual round, decrees and resolutions of the gods," but that they seemed to move as gods.

In some respects the planets would seem to be possessed of greater power than the sun and moon. These two orbs, though moving on the star-sphere, seemed obliged to move always in the same direction, and even on the self-same track, for it would be long before the varying path of the moon would be recognised. The other five moving bodies were free to pursue such tracks as seemed good to them, "now high, now low, then hid, progressive, retrograde, and standing still." In this freedom there must certainly have been recognised an element of power. Moreover, some of the planets were seen to travel with much statelier solemnity of motion than either the sun or moon, while every one of the five moved more slowly than the moon, which circles the star-spheres in $27\frac{1}{3}$ days. Comparative slowness or stateliness of motion would be recognised by those first observers (who supposed that everything they saw they must be able to interpret) as indicating superior dignity, if not superior power.

With regard to power, indeed, they would be quite prepared to believe that "great or bright infers not excellence." It is quite likely that the influences of the stars on the earth and on the fortunes of men and nations, were considered fully equal in importance to the influences of the sun and moon. And though the five planets might not pour heat on the earth, or raise tides, they might well be supposed to exert other influences, which though less obvious might be equally or even much more important. What

these were, the lively imaginations of those early observers quite readily determined. To the moon had been assigned the *rôle* of chief measurer of time, and potent influence on all belonging to the month; in the sun they recognised the chief ruler of the seasons, and the lord of wealth, because the produce of their fields, alike in tillage and in pasturage, depended manifestly on his power. The influences assigned to the planets were more subtle but not less potent. The ruddy Mars, with his strangely varying splendour, ruled the fortunes of war, exciting men to conflict, and in battle stimulating these and weakening those, according as the god was disposed to favour or to anger. Venus, most beautiful of all the planets as seen with unaided vision, growing more brilliant as the sky darkens, but languishing with the growing day

> to faint in the light that she loves,
> The light of the daffodil sky,

seemed as obviously to be the orb which swayed the hearts of men to love—a goddess, therefore, though perchance had women had the sexing of the planets, Venus would have been a masculine deity. The swift movements of Mercury, and the way in which he flashes into his greatest glory and anon hides himself amid the beams of the sun, suggested as naturally a deity moving men to brilliant subtleties, to craft and stratagem, if not to robbery and plunder. In regard to Saturn, again, there could be little doubt. The slowliest moving of all the planets known to the ancients, gloomy in aspect (though now known as most beautiful), what other position could be assigned him than that of a woe-working, penalty-inflicting deity, most to be dreaded if not most powerful of all the heavenly host? Jupiter's position and influence were probably determined rather by comparison with the other celestial bodies than by any suggestions derived from his aspect or movements. Considered in himself, indeed, he suggests glory and steadfastness, because he surpasses all the stars in brightness and all the planets of the *night* (Venus being never seen when it is actually night), while he moves so statelily that he is nearly twelve years in completing his circuit of the zodiacal pathway of the gods. But it is by comparing him with Venus for lustre, with Saturn for steadiness of light, and with the sun for stateliness of motion that the planet-worshippers of old came to assign to Jupiter his position as governing the fortunes of chiefs and rulers among men. If Saturn were gloomy and solemn, Jupiter was dignified and stately; if Venus gave love, Jupiter gave control; if the sun bestowed wealth, Jupiter bestowed power.

There were thus seven celestial rulers, diverse in power and influence, diverse also in dignity, the sun and moon, Mercury, Venus, Mars, Jupiter, and Saturn—the seven planets of ancient astronomy. How should these be classified? How could they be classified but by reference to that one quality which was common to them all, the quality distinguishing them from the fixed stars, their motion around their zodiacal roadway? Classed thus the planets would have the order:—

1. Saturn, most potent for *evil*.
2. Jupiter, most potent for *good*.
3. Mars, most potent in *strife*.
4. The Sun, most potent for *wealth*.
5. Venus, most potent in *love*.
6. Mercury, most potent for *craft*.
7. The Moon, most potent in working *change*.

How other relations would be recognised or imagined, and the metals, numbers, forms, and so forth, would be associated with the various planets, need not here be considered, though in passing I may notice that the readiness and completeness with which in old times they found out all about the planets, metals, numbers, geometrical figures, times, &c., &c., and the relations of these to each other and to the fortunes of individuals and of races, afford instructive illustrations of the confidence of ignorance. The nascent doubts of half-knowledge, and the gradual rising of doubt to its place as chief among the scientific virtues, would have been unintelligible to the men who confidently decided that there are seven metals each associated with one of the seven only planets, in the order quaintly stated by Chaucer:—

> Sol gold is; and Luna silver we threpe;
> Mars iron; quicksilver Mercury we clepe;
> Saturnus lead; and Jupiter is tin;
> And Venus copper, by my faderkin.*

When the five planets had been associated with the sun and moon as deities of the same order, it naturally followed that the sacrificial system was extended to include all seven orbs. Set times and seasons were appointed for the ceremonial observances belonging to the heavenly rulers of the world.

The year having been already assigned to the sun, and the month to the moon, the only way in which the planets could be dealt with, in regard to set times, was by assigning to them the days and the subdivisions of the days. The week already existed, we may be sure, for among all ancient races we find this natural division of time by a rough approximation to the times of new moon, half moon, full moon, and half moon again. Most probably, however, at its first beginning, the week really was marked off by these phases, and not, as later, by seven days. In semi-savage days there would be no greater inconvenience from the occasional lapse of a day to get the weeks right with the moon than before the beginning of chronological exactness there would be any trouble in throwing in a few days to make the year right, as in the rough-and-ready calendar systems of the *ancient* ancient Egyptians. Probably, as accurate observations of the moon came to be made, the idea of making a lunar month thirty days, instead of roughly calling it four weeks, and so having in each month six weeks of five days, may have arisen. Nay, we know that among certain nations this change was attempted, and that in a proportion of these it was successfully introduced. The five planets proper would then doubtless have been assigned to the five several days of the week. But among races which retained the week of seven days, and substituted the uniform succession of such weeks for the mere fourfold division of the actual moon-circuits (from "new" to "new") all the seven moving orbs would be associated with the week, each as governing its own particular day. If by this time, as must certainly have happened, the day itself had been divided into portions, then, as these would have to be assigned severally to *their* celestial rulers, a certain difficulty would arise. For even as the first hour of each day symbolises the glory of the sun as natural Ruler of the Day, so if each planet is to rule a day in some more artificial system, the first hour must be the special hour besides belonging to the special day of that planet's rule. And the hours of each day must also be assigned in uniform succession—seven hours by seven hours—to the seven planets. We may assume the early division of the day into twenty-four hours, though probably daytime was divided into twelve equal hours and night-time into twelve equal hours, only equal to the hours of daytime at autumn and spring.

We can easily set ourselves the problem which was set the ancient planet worshipper. There are seven days, each

* It is noteworthy that in Numbers xxxi. 22, 23, where six of the metals corresponding to the seven planets of the ancients are mentioned, we have after gold and silver, which naturally are put first, the remaining four in the order of the distances of the corresponding planets—viz., brass, iron, tin, lead.

of twenty-four hours, and we want the hours assigned in succession to the seven planets taken in some suitable order, and each of the seven days assigned, by its first hour, to a different planet. But so soon as we have selected a suitable order for the planets—that, namely, indicated above—the problem practically solves itself, as the following table shows:—

Saturn .	1	8	15	22	5	12	19	2	9	16	23	6	13	20	3	10	17	24	7	14	21	4	11	18
Jupiter .	2	9	16	23	6	13	20	3	10	17	24	7	14	21	4	11	18	1	8	15	25	5	12	19
Mars . .	3	10	17	24	7	14	21	4	11	18	1	8	15	22	5	12	19	2	9	16	25	6	13	20
Sun . .	4	11	18	1	8	15	22	5	12	19	2	9	16	23	6	13	20	3	10	17	24	7	14	21
Venus . .	5	12	19	2	9	16	23	6	13	20	3	10	17	24	7	14	21	4	11	18	1	8	15	22
Mercury .	6	13	20	3	10	17	24	7	14	21	4	11	18	1	8	15	22	5	12	19	5	9	16	23
Moon . .	7	14	21	4	11	18	1	8	15	22	5	12	19	2	9	16	23	6	13	20	3	10	17	24

Here I have simply counted the hours in order—seven by seven—after the order of the planets, and also 24 by 24. The first day is sacred to Saturn (our Saturday), and its first, eighth, fifteenth, and twenty-second hours are also sacred to the gloomy and malign god. The first known of the second set of twenty-four is sacred to the sun, to whom therefore the next day (or Sunday) is sacred. So, following out the series of hours, we find the third day sacred to the moon, giving Monday; the fourth to Mars, giving *Martis dies*, or *Mardi* (with us Tuisco's day, or Tuesday, Tuisco being the Scandinavian Mars); the fifth day to Mercury, giving *Mercuris dies*, or *Mercredi* (our Woden's day, or Wednesday); the sixth day to Jupiter, giving *Jovis dies*, or *Jeudi* (our Thor's day, or Thursday); and finally, the seventh day to Venus, *Veneris dies*, or *Vendredi* (our Freya's day, or Friday).

Of course, among races who had long worshipped the sun and moon, Sunday and Monday would be taken as the first two days of the week (probably a method of distributing the days and hours which brought these two days together would be regarded as a heaven-sent revelation). And it would seem very natural to regard the day which fell to the gloomy and slow-moving Saturn as suitably coming last, and a proper time to rest after the week's work, especially as any work on the day ruled by so malignant a heavenly body would naturally be deemed unfortunate if not wicked—probably unfortunate first, wicked in later days. Hence among the ancient Babylonians, Egyptians, and other races of the more civilised sort, arose the Saturday rest or Sabbath, which certainly was enjoined in Chaldæa, Assyria, and Egypt, centuries before the less civilised and less intelligent Hebrew race became acquainted with the institution.

The Jewish system of sacrifices and ceremonial in regard to the Sabbath and the new moon, may be considered to indicate the nature of the original Sabæan system, notwithstanding the obvious attempt made by the Jewish legislators to get rid of the worship of the heavenly host, even while retaining its ceremonial and many of its most peculiar forms and ideas.

(To be continued.)

HUNTING AS SPORT.—Few human characteristics speak more clearly of our descent from savage and brutal ancestors than the habit of regarding the pursuit of animals as sport. Of course the pursuit of animals for food may be regarded as legitimate, and the pursuit of destructive animals for the purpose of destroying them and removing a source of danger is also legitimate; but to regard even these methods of slaying our fellow-creatures as sport is degrading and barbarous. It would be in like sort degrading if men who make researches by the method of vivisection were to take actual pleasure in the operations by which their "subjects" were tortured. Regarding vivisection properly conducted as legitimate, we yet expect the vivisectionist to diminish as much as possible the sufferings of the creatures on which he has to experiment. If he gloated over such sufferings, we should despise him as a brutal savage. But we cannot logically avoid the same decision in regard to the man who recognises sport in the chase and slaughter of wild animals.

THE STORY OF CREATION.

A PLAIN ACCOUNT OF EVOLUTION.

By EDWARD CLODD.

VII.—PRESENT LIFE-FORMS.

IF the life-forms of the past somewhat baffle us by their scantiness and imperfectness, those of the present embarrass us by their abundance. But although the existing species of plants and animals are numbered by hundreds of thousands, and the tale is not yet complete, they are classified into a few primary divisions or sub-kingdoms representing certain allied types, of which the several species included in each sub-kingdom are modified forms. For example, flies and lobsters, beetles and crabs, are grouped in the sub-kingdom of the Annulosa, because they are alike composed of distinct segments; boys and frogs, pigs and herrings, are grouped in the sub-kingdom of the Vertebrata, because they alike possess an internal bony skeleton, the most important feature of which is the spine or vertebral column. And this classification, as remarked already, is applicable alike to past and present organisms, there being throughout the whole series of fossil remains no form, however unlike any existing living thing, that is not to be placed in one or other of the sub-kingdoms.

Moreover, a fundamental unity underlies and pervades the whole, a unity of material, of form, and of function, the differences between organisms, from the slime of a stagnant ditch to the most complex animal, being in degree and not in kind. Therefore, although each genus, nay, in most cases, each species, needs for its complete study the labour of a life-time, it suffices for the majority of us, grateful for the results which the zeal of specialists has achieved, to acquaint ourselves with the essential characteristics which mark the main divisions of the twin sciences of Botany and Zoology. Not only is this the only possible thing for us; it is the one thing needful for all, specialists and non-specialists, otherwise the significance of facts, in their relation and dependence, is missed; the larger generalisations are swamped in a sea of detail; we cannot, as the phrase goes, see the wood for the trees.

In the old definition of the three kingdoms of nature, the mineral, the vegetable, and the animal, we were taught that plants grow and live, while animals grow, live, and move. But this no longer holds good, at least in respect of the lower forms. There are locomotive plants and stationary animals. The swarm-cells or zoospores which are expelled from some of the lower plants, as algæ and certain fungi, behave like animals, darting through the water by the aid of hair-like filaments called vibratile cilia, finally settling down and growing into new plants; others, as diatoms and desmids, are locomotive throughout life; certain marine animals, as sponges and corals, are rooted to the spot where they grow; while there are organisms which appear to be plants at one stage of their growth, and animals at another stage.

Other marks of supposed unlikeness have vanished. It was formerly held that among the distinctive features of animals are (1) a sac or cavity in which to receive and digest food; (2) the power to absorb oxygen and exhale carbonic acid; and (3) a nervous system. But although nearly all animals, in virtue of their food being solid, have a mouth and an alimentary cavity, there are certain forms without them, and although plants, in virtue of their food being liquid or gaseous, need not that cavity, there are plants that have it. Not only is the process of digestion apparent in the leaves of carnivorous plants, but embryonic forms have been found to secrete a ferment similar to the ferment in the pancreatic secretion of animals, and by which they dissolve and utilise the food-stores in their seed-lobes as completely as food is digested in our stomachs. And

although green plants, under the action of light, break up carbonic acid and release the oxygen, they do the reverse in the dark, as also in respiration; while the quasi-animal fungi, which are independent of light, absorb oxygen and give off carbonic acid.

In the "irritability" of the sundew, Venus's fly-trap, and other sensitive plants, still more so in subtile and hidden movements in plant-cells, we have actions corresponding to those called "reflex" in animals, as the contraction of the shapeless amœba when touched, or the involuntary closing of our eyelid when the eye is threatened, or the drawing back of one's feet when tickled. The filament in the amœba which transmits the impulse causing it to contract differs only in degree from the sensory nerves in ourselves which transmit the impression to the motor nerves, causing the muscles to act; and since there is every reason for referring the contractile action of plants, *i.e.* their movements in obedience to stimulus, to like causes, the germs of a nervous system must be conceded to them. The minute observations of Mr. Darwin and his son into the large class of quasi-animal movements common to wellnigh all vegetable life go far to confirm this. The highly sensitive tip of the slowly revolving root, in directing the movements of the adjoining parts, transmitting sensation from cell to cell, "acts like the brain of one of the lower animals; the brain being seated within the anterior end of the body, receiving impressions from the sense organs and directing the several movements."

In these and kindred vital processes, in the so-called sleep of leaves, and the opening and closing of flowers, both regulated by the amount of light, apparently acting on them as it acts on our nervous system; in the detection of subtle differences in light, which escape the human eye, by plants; in their general sensitiveness to external influences, even in the diseases which attack them, the study of which Sir James Paget has commended to pathologists, we have the rudiments of attributes and powers which reach their full development in the higher animals, and therefore a series of fundamental correspondences between plant and animal which point to the merging of their apparent differences in one community of origin.

In fine, that which was once thought special to one is found to be common to both, and to this there is no exception. Not only is there correspondence in external form in the lower life-groups, but, fundamentally, plants and animals are alike in internal structure, and in the discharge of the mysterious processes of nutrition (although, as will be shown presently, this forms a convenient line of separation) and of reproduction. All, from the lowest to the highest, have their unity and kinship in ancestral life which was neither plant nor animal.

Of course the difficulty of classifying vanishes in the higher forms; the lowest plants are allied to the lowest animals, but the higher the plant the more it diverges from the animal, which is evidence that in the succession of life the highest plants do not pass into the lower animals. Descent is not lineal, but lateral; the relations between the two kingdoms are represented by two lines starting from a common point and spreading in different directions. Even "lower" and "higher" are relative terms; the organisation of the amœba is as complete for its purpose as is that of the man for his purpose, the modification in the complex forms being due to the division of functions which are performed in every part by the simple forms.

Although the foregoing and numberless other facts, together with the law of continuity, alike forbid the drawing of any hard and fast lines, and involve the conclusion, to borrow Professor Huxley's words, "that the difference between animal and plant is one of degree rather than of kind, and that the problem whether in a given case an organism is an animal or a plant may be essentially insoluble," there exists, exceptions notwithstanding, a broad distinction in the mode of nutrition.

> "All things the world which fill
> Of but one stuff are spun,"

and this stuff, the basis of all life, the formative power, is a semi-fluid, sticky material, full of numberless minute granules in ceaseless and rapid motion, to which the name "protoplasm" (Gr. *prōtos*, first; *plasma*, formed) has been given. It consists of four of the elementary substances, carbon, hydrogen, oxygen, and nitrogen, complexly united in the compound called *protein*, which is closely identical with the albumen or white of an egg. These are the *essential* elements, but a few others enter into the chemistry of life, with slight resulting differences in the *incidental* elements in animals and plants. As water is necessary to all vital processes, a very large proportion enters into living matter.

But there is this fundamental and significant difference between the two kingdoms. The plant possesses the mysterious power of weaving the visible out of the invisible; of converting the lifeless into the living. This it does in virtue of the chlorophyll, or green colouring matter, which is found united with definite portions of the protoplasm-mass, of which it is a modification, the exact nature being unknown.* The water and carbonic acid which the plant absorbs through the numberless stomata or mouth-pores in its leaves or integument are, when the sunlight falls upon them, broken up by the chlorophyll,† which sets free the oxygen, and locks together the hydrogen and carbon, converting this hydro-carbon into the simple and complex cells and tissues of the plant, with their store of energy for service to itself and other organisms. Animals, a few low forms excepted, cannot do this; they are powerless to convert water, salts, gases, or any other inorganic substances, into organic; they are able only to assimilate the matter thus supplied by the plant, nourishing themselves therewith either directly, by eating the plant, or indirectly, by eating some plant-feeding animal. In other words, the plant manufactures protein from the mineral world, and the animal obtains the protein ready-made; the plant converts the simple into the complex; and this the animal, by combining it with oxygen, consumes, using up the energy it thereby obtains in doing work. So the plant is the origin of all the energy possessed by living things, but why it can by virtue of the sunshine convert the stable inorganic into the unstable organic, while the animal cannot, we do not know. Neither do we know whether plant preceded animal, or *vice versâ*, in life's beginnings, although the evidence, which will be considered in its place, seems to point in favour of the priority of the plant. Structurally the lowest animal is below the lowest plant, since it is a speck of formless colourless protoplasm, whereas the protoplasm of the lowest plant is organised to the extent that it has formed for itself an outer layer or membranous coat called the cell-wall. For example, the vegetable character of yeast-granules is determined, apart from their mode of nutrition, by the protoplasm being inclosed within a cellulose coat, and the animal character of the amœba, not because of contractile or locomotive power or of inability to manufacture protein from inorganic matter, but by the absence of any such covering. Upon this Haeckel remarks that the vegetable cells sealed their fate when inclosed within a hard thick cellular shell, being thereby less accessible to external influ-

* Chlorophyll is found in green fresh-water polyps and a few other small animals, but is thought to be due to a vegetable parasite.

† The formation of chlorophyll in complete darkness, but under sufficiently high temperature, has been observed in a few instances.

ence, and less able to combine for the construction of nervous and muscular tissues than the animal.

But since the function creates the organ, and where function is not localised there is no variation of parts, life probably began in formless combinations having no visible distinction of parts. And as the cell is the first step in organisation, it is the fundamental structure of living things, "it marks only where the vital tides have been and how they have acted," the lowest organisms consisting of one cell only, and the higher consisting of many cells, which, increasing in complexity or diversity of form adapted to their different functions at later stages, are modified into the special tissues, with resulting unlikeness in parts or organs, of which all plants and animals are composed. Every variation in structure is therefore due to cellular changes, and every living thing is propagated in one way or another by cells, by their self-division or multiplication; or by gemmation, *i.e.*, throwing off buds; or by the union of like cells; or, in more complex mode, by the spontaneous or aided union of unlike cells, as the sperm-cell of the male with the germ-cell of the female, giving rise to a seed or egg from which grows offspring more or less like its parents. The importance of embryology in explanation of the laws of development will be dealt with later on.

In both plant and animal the cell-contents usually, although here again exceptions occur in some of the lowest organisms, exhibit a rounded body called the *nucleus*, which itself often incloses another body called the *nucleolus*, the functions performed by both of which in cell-development are obscure. That even thus much is known of cell structure may awaken wonder when it is remembered that we are dealing with bodies for the most part beyond the range of our unaided vision. Bacon truly says that "the complexity of nature exceeds the subtlety of man"; the infinite divisibility and indivisibility of matter is apparent in the organic as in the inorganic; and size counts for little; the oak and pine, the acacia and the rose, are lower in the scale of life than the thistle and the daisy; the elephant is 150,000 times heavier than the mouse, but the egg of the one is nearly as large as that of the other, and it has been calculated that if one molecule in the nucleus of the ovum of a mammal were to be lost in every second of time, the whole would not be exhausted in seventeen years.

These molecules are the sufficing material media of transmission of resemblances, both striking and subtle, between parent and offspring; and of the vast sum-total of inherited tendencies, good or bad, which are the product of no one generation, but which reach us charged with the gathered force of countless ancestral experiences.

> Born into life! man grows
> Forth from his parents' stem,
> And blends their bloods, as those
> Of theirs are blent in them;
> So each new man strikes root into a far fore-time.

ANIMAL WEATHER-LORE IN AMERICA.

By CHARLES C. ABBOTT, M.D.

IN reference to the dog, I have heard the following pretentious stanza, which has now taken its place among our nursery rhymes, where, indeed, it is best fitted to remain:—

> When drowsy dogs start from their sleep,
> And bark at empty space,
> 'Tis not a dream that prompts them to,
> But showers come on apace.

Here we have essentially the same inference as in that of the rhyme about cows, but it is not to be explained away so readily. Such acts as described cannot be attributed to annoyance by flies, for they too often emerge from dark quarters, where they have been unmolested; but the all-important fact must not be overlooked that such acts are not confined to summer. If they were, the electrical theory might be advanced with some confidence. From what I have noticed in such dogs as I have owned, the habit of dreaming—which in the rhyme is denied to be the explanation—is probably the key to the mystery. Again, statistics show that the correspondence between such habits and sudden showers is only what we should expect in the way of coincidences. Dogs certainly are not to be considered as reliable barometers.

The same may be said of the domestic cat. Its movements have all been carefully noted, and the yawning, stretching, scratching, and waving of the tail appear to have been accredited with some special meteorological significance. Careful observation has not confirmed any of these impressions. Table-legs are scratched time and again by Tom or Tabby, and no rain falls for twenty-four or forty-eight hours. They stretch themselves after a nap, lick their sides and wash their faces with the same regularity in midwinter as in midsummer, yet it is only showers, and not snow-storms, which these actions are supposed to predict.

When in summer the signs fail, my country friends conveniently forget the remark they have made; but, if the day does prove showery, my non-combative neighbours take much delight in repeating over and over again, "I told thee so," with a suggestive emphasis, showing how much, like other people, they love to gain a victory, if open warfare can be avoided.

The only weather-rhyme referring to a cat that I have heard, and which is essentially the same as that about dogs, runs thus:

> When Tabby claws the table-legs,
> She for a summer shower begs.

That is, begs it will hurry, with no doubt in her mind of its possibly disappointing her.

The weather-lore of the commoner wild animals is of much more general interest. Weather-sayings referring to animals do not appear to have been so numerous as are those referring to birds. I have been able to learn of but three examples. In reference to minks and weasels I have heard it said, and possibly others may be familiar with this mystic rhyme:

> When storm-winds blow and night is black,
> The farmer may a pullet lack;
> But, if the moon is shining clear,
> No mink or weasel dares come near.

This involves an interesting phase of the life-history of these animals; for while they probably can see a little when it is quite dark, and are safely guided by the sense of smell, nevertheless, the experience of trappers about home proves that they do wander about during moonlight nights. Indeed, on careful inquiry, it seems that the trapper generally anticipates better success during the moonlit nights than when it is very dark. I strongly suspect that the truth lies in the fact that, when it is dark and stormy, the watchful house-dog is not on the alert, and thus the cunning weasel or mink is free to raid upon the poultry-house and feast upon the pullet that it seizes. How my neighbours will take to this explanation I can only surmise. Like other people, they fight vigorously for the opinions they have cherished through life. The musk-rat and grey squirrels have given rise to many trite sayings, and have long been looked upon as weather-prophets, but that they are nothing of the sort I have elsewhere * endeavoured to show.

* "Rambles about Home," p. 73, D. Appleton & Co., New York, 1884.

The following may or may not be a local saying :—

When flying-squirrels run on ground,
The clouds 'll pass you by, be bound.

What this may mean has been a question with me for a long time. It is a common remark, either in this or a simpler form, and many, who have little faith in pigs or dogs as weather-prophets, build largely upon the habits of the flying-squirrel. The saying itself implies that a drought exists at the time that these animals frequent the ground rather than the trees, coming, of course, thereto in order to find food. If the saying be true, the summer food of the flying-squirrel must be more plentiful on the ground than in the tops of the tallest trees. What that food is exactly I am not aware, nor have I had any opportunity to verify the statement that flying-squirrels frequent the ground during "dry spells." Those that I have seen near home are so strictly crepuscular that only the initial movements of their nocturnal journeys are readily traced; but, whenever I have seen them sally from their retreats, it was to take a tree-top route for several rods and then to be lost to sight. Take the year through, it is probable that they seldom come to the ground to forage. When they do so, is it an evidence of continued dry weather? I can neither contradict nor affirm; but are not the probabilities against such being the case?

Speaking of the opossum, it is said that, if found in autumn in hollow trees, the winter will be milder than if occupying a burrow in the ground.

This seems to be very reasonable, and would pass admirably as a weather-sign but for one unfortunate circumstance. While you may find one or more in a tree, your neighbour may find as many in the ground. I have known this to be the case more than once. Under these circumstances, meet your neighbour at the line-fence and compare notes. What about the winter?

From their greater abundance and never-failing presence, it might be thought that the weather-lore of birds would be much more elaborate than that referring to other classes of animals; but my observations do not confirm this. There are simply a greater number of sayings current, and fully one half are too trivial to repeat. It would seem as if a weather-lore possibly of Indian origin and referring to birds then abundant, but now wholly wanting, was current more than a century ago. These sayings were subsequently applied to other species, nearly or more remotely allied, and whatever meaning they may originally have had has been lost; but the apparent absurdity of such "proverbs," as now used, seems never to have occurred to those who repeat them.

That the clucking of chickens, cackling of geese, and the "potracking" of Guinea-hens have not given rise to an elaborate series of weather-proverbs is, I think, surprising. The only familiar reference to the chicken heard about home is that the rooster, crowing at night, says, "Christmas—coming—on!" It does appear that the midnight crowing of cocks is more frequently heard in December than in June; but, so far as the meaning is concerned, it unfortunately happens that the nocturnal crowing is as often heard in January as in December. Calling attention to this, I was once gravely assured that the cocks crew differently then, and said, "Christmas—come—and—gone!" I accepted the explanation. This is not a weather matter, but is not irrelevant, as it shows how very common it once was to couple any unusual occurrence with something sooner or later to happen, and therefore, in the matter of weather especially, to claim it as prophetic of that event.

Of the examples of weather-lore of birds, the following are not uncommonly heard in Central New Jersey. Of the cardinal-grossbeak, or winter redbird, it is said :

The redbird lies, without regret:
However dry, it whistles "wet!"

That is, the bird is credited with knowing it will not rain, and teases the farmer by singing "wet" in his ears all day. Others put another meaning on the redbird's note, and claim it to be a sure sign of rain. This is more like the ordinary sayings commonly heard, and let us give it a moment's consideration. At present, the time of year when the cardinal-birds sing least is during the hot summer months. Not that they are absolutely mute for even a few days at a time, but relatively so as compared with their joyous strains through autumn and winter; and again, early in summer, when they are nesting, these birds, like robins, are more apt to sing directly after a shower than at any other time.

So much for the gay cardinal as a weather-prophet. The rare summer redbird—a tanager—which also utters a whistling note, well described by the syllable "wet," shortly and sharply expressed, is likewise said to prophesy rain. The probabilities are that the note of the redbird, cardinal and summer, suggesting the word "wet," has given rise to the belief that their utterance was a sign of a coming shower or storm. It is often by such illogical methods that these sayings have become established. After a few repetitions they become fixed in the mind and their origin forgotten; they are invested with an importance not their due, and not attributed to them by their originators. Ultimately they are incorporated in the weather-lore of the country.

Of the innumerable swallows, it is said, with as little show of reason :

No rain e'er poured upon the earth,
That damped the twittering swallow's mirth.

No? Well, of late, the whole host takes refuge from storms—the barn-swallows in the hay-mow, the cliff-swallows under the eaves, the sand-martins in their burrows, and the chimney-swifts in their sooty homes in the chimneys. Why this change of habit? For a wonderful change must have taken place if the couplet quoted was ever true. I do admit that swallows and swifts appear to be noisier before and during a shower; but does not this arise from the fact that at such a time they collect in great numbers near their nests to take refuge if the storm should increase in violence? And again, the silence of other birds makes the twittering swallow a more prominent bird than under other circumstances; but nothing of this warrants the extravagant assertion that no storm ever put a quietus upon them.

The larger hawks, too, are supposed to give warning of a coming shower when they utter their peculiar cat-like scream. Among our old people the following may sometimes be heard repeated :

The hen-hawk's scream, at hot, high noon,
Foretells a coming shower soon.

This couplet is of some interest, as, at present, it is not applicable to our larger hawks and buzzards. Indeed, the only one of them that is prone to cry out while circling overhead is the red-tailed buzzard or hen-hawk, and this bird is very seldom seen in midsummer, and now certainly is only heard in autumn, winter, or early spring. The saying implies that formerly these birds were abundant at all times of the year, and during the summer would cry out in their peculiar fashion. The settlement of the country and general deforesting of such a large portion of it have driven these hawks to more retired parts during the nesting season, and there, throughout summer, their cry may indicate that it will soon rain; but, if so, why does not the same cry in autumn have some reference to the weather?

It is scarcely necessary to continue the list. Other birds than those mentioned—reptiles, batrachians, and fishes—

have all given rise to certain current sayings, but of no more value than those I have given, and all, I think, based upon illogical inferences. Snakes are claimed as excellent barometers; but the habits upon which the belief rests are those that characterise every day of the creature's life. Toads and frogs are largely depended upon, but a careful record for a single season will show how little they are to be trusted; and even the fishes cannot disport themselves in summer but straightway the clouds must open upon us, a tornado visit us, or premature frosts balk the calculations of the farmer.

Curiously enough, I do not find that insect life has entered to any important extent into the weather-lore of this neighbourhood. Contradictory remarks are often made as to ant-hills: thus, when they are very high, it will be a dry day; others insist that it is evidence that it will soon rain. Spiders' webs, also, are variously held as of barometric value; but a careful record of several summers contradicts this emphatically. The positions of the paper-hornets' nests, which in autumn are often prominent objects in the country, after the foliage drops, are variously asserted to be indicative of a "hard" or "open" winter, as they chance to be placed in the upper or lower branches of a tree. My scepticism as to the value of this sign arises from the fact that there is, as might be expected, no uniformity in the positions of any half-dozen such nests.—*Popular Science Monthly.*

COAL.

By W. Mattieu Williams.

THE MEASURES ABOVE AND BETWEEN THE COAL.

IN my last I described the vegetable deposits that are now occurring in the Norwegian fjords and certain lakes, and stated my reasons for concluding that such deposits must ultimately become true coal seams; that they present us with an actual and natural demonstration of how coal seams may be formed, and how they probably were formed, during the carboniferous period, under far more favourable conditions of climate, and therefore more rapidly and effectively. So far, I have only described the operation of laying the trees on the beds of the lakes and fjords, with no other covering than the water; this, of course, suggests an apparent difference between the present and the past, the ancient coal seams being buried under deposits of mineral matter, so attached and connected with them as to indicate that the action of vegetable deposition and that of mineral deposition must have somehow been alternate. Is there any such action at present proceeding in connection with the present-day coal formation that I have described?

I am able to answer this question. Some typical cases are supplied by the arms of the Sogne fjord, which I have already mentioned as displaying good examples of the vegetable avalanches. This great inlet has been well compared, so far as ground-plan outline is concerned, to the trunk of a tree with many branches and twigs. The branches are the lateral fjords, some of great depth and walled with perpendicular rocks, such as the Nerö fjord; others with steep slopes, more or less wooded. The twigs are the rivers or torrents with which all these arms terminate, usually many such torrents to each of the branches, and each torrent, of course, flowing along the bottom of its own valley.

One of the most magnificent of these valleys is the Justedal. It is rarely visited by tourists, having no roadway for carrioles and no stations. It proceeds upwards to the Justedalsbrae, the largest glacier ground in Europe (500 square miles of ice), and the summit region of Scandinavia, the Jotunhjem (the home of the giants). I came upon this valley from above, in 1856, after a rather adventurous solitary walk (see "Through Norway with a Knapsack," chapters x., xi., xii.), and on reaching the lower part of the valley found a sudden and curious contrast to the desolation of ice and snow and glaciated rock I had just left. This change was due to the fact that I had now arrived at the original terminal boundary of this arm of the fjord, the ancient shores of which were as definitely marked as though the water were still there. Instead of the water surface there was a level plain richly cultivated with luxuriant pastures and heavily-laden fruit trees. The cause of this transformation is evident at a glance. The Storelv (the big river) which starts from a gloomy, ice-bordered lake, the Styggevand, and receives contributions from half-a-dozen glaciers, on its way down the Justedal, is turbid with rock débris. So long as it continues its brawling course between moraine boulders, the stirring keeps these particles suspended, giving it the characteristic milky appearance of such streams; but when it reaches the calm water of the deep fjord, these particles drop to the bottom, cover the previous deposit of fallen trees, and finally fill up the fjord to the topmost level of its waters. I carefully traced this deposit to the present shores of the fjord, and on bathing traced it further still as an extensive subaqueous plain, stretching right across this branch of the fjord. This plain being covered with turbid water, its level will go on rising until it will become high and dry and cultivated right across from Ronnei, to Marifjören on the opposite side.

I have thus fully described this instance because it is a characteristic example of what is going on more slowly and less strikingly in every one of the thousands of terminal branches of the Norwegian fjords. These plains are so characteristic as physical features of Norway, that they have received a special name, *Ör*, or, with the definite article attached, *Ören*. Thus Laerdalsören, the sands of the Laerdal; Sundalsören, the sands of Sundal; Bolstadören, Dalsören, Viksören, Gudvangsören, &c., &c. They are usually sandy, varying according to the rocks over which the river flows and the degree of glaciation to which they may have been subjected. Such deposit, of course, covers the vegetable deposit that may have preceded it at the bottom of the fjord, and it is continually, though very slowly, advancing. If the present conformation and physical conditions continue for a few hundreds of thousands of years, most of the Norwegian fjords will be filled up and their places occupied by extended ör. They correspond to the deltas which are formed when rivers flow directly into the open sea.

Lakes are similarly filled up; the vegetable deposit of the Achensee is being similarly silted over at the end where the river enters. Such lakes are merely expansions of the river itself where it comes upon a deep outstretch of its valley. The shores of the Lake of Geneva have advanced six miles from the original boundary of the upper end of the lake, and, as Lyell says, "we may look forward to the period when this lake will be filled up." Similar examples might be multiplied indefinitely.

The whole of the north-west coast of Norway, including all the fjords that branch inward therefrom, and all the valleys above the fjords, display a most interesting series of terraces. A steep slope of recent deposit, commonly glacial "till," rises from the river at the valley bottom like a railway embankment, then a flat, then another bank topped by another level, and so on in a series of steps up to a height of 600 feet above sea level. If any of my readers visit Norway they should observe these. They are magni-

ficently displayed from the railway between Trondhjem and Stören, where the line crosses many of these valleys with the step terraces extending up them and visible for miles. They show that all these valleys within a geologically recent period have been under water, were arms of fjords 600 feet deep at their present mouths, and there are evidences to show that several alternations of rising and falling either of the land or the sea level have occurred.

We have only to suppose that similar conditions existed in the carboniferous period to account for the covering up of the lowest of the coal seams and the redepositing and recovering of other seams in successive alternations of the level of such fjords or long, steep estuaries—always remembering that the climate of the carboniferous period (proved by its vegetation) was vastly more favourable to luxuriant vegetation than that of arctic and sub-arctic Norway.

There is no difficulty in accounting for the isolated trees, reeds, &c., found in the coal-measures—some lying down, some upright, and others inclining at all angles. The silting would take place at the upper end of the lake or fjord simultaneously with the occasional downfall of vegetable avalanches, and thus the trees and all other vegetation of the denuded slopes would be bedded in the mineral matter as we find them; the probabilities of upstanding position being largely increased by the fixing of the lower portion of those trees that had sunk in such position in consequence of the stony matter adhering to their roots. A curious result would be likely to follow in such cases. The tree thus standing upright, or moderately inclined, would be slowly surrounded by the mineral deposit, and at the same time be slowly decomposing. If this decomposition of the vegetable matter were completed before the tree became wholly buried its place would be occupied by a tube, and the unburied upper portion would break off, leaving the tube open at the top. Into this open tube mineral matter would of course descend, forming a core or column occupying the space formerly filled by the tree. Are such cores or columns ever found in the coal measures?

The following shows that they are:—"In a colliery near to Newcastle, say the authors of the 'Fossil Flora,' a great number of *Sigillariæ* were placed in the rock as if they had retained the position in which they grew. Not less than thirty, some of them 4 or 5 feet in diameter, were visible within an area of 50 yards square, the interior being sandstone, and the bark having been converted into coal. The roots of one individual were found imbedded in the shale, and the trunk, after maintaining a perpendicular course and circular form for the height of about 10 feet, was then bent over so as to become horizontal. Here it was distended laterally, and flattened so as to be only 1 inch thick, the flutings being comparatively distinct. Such vertical stems are familiar to our miners, under the name of coal pipes. . . . These coal pipes are much dreaded by our miners, for almost every year in the Bristol, Newcastle, and other coal-fields, they are the cause of fatal accidents. Each cylindrical cast of a tree formed of solid sandstone, and increasing gradually in size towards the base, and being without branches, has its whole weight thrown downwards, and receives no support from the coating of friable coal, which has replaced the bark. As soon, therefore, as the cohesion of this external layer is overcome, the heavy column falls suddenly in a perpendicular or oblique direction, from the roof of the gallery whence the coal has been extracted, wounding or killing the workman who stands below."—Lyell's "Elements of Geology," pp. 478–79 of fifth edition.

Such a tube penetrating the bottom deposit and suddenly opened when the upper part of the partially decomposed or rotted tree fell down would naturally fill up to a given depth in a shorter time than would be necessary for the formation of the same depth of deposit all around it, as the river stream bearing the solid matter drifted over it. If there were variations of material in the strata (as are found to occur), these would not be represented inside the tube; all its materials would belong to the period succeeding the exposure of its mouth. This is confirmed by the usual structure of these coal pipes. Sir Charles Lyell describes, in the work above quoted, the interior stratification of several of such trees which differ from the strata around them. In one example "the layers of matter in the inside of the tree are more numerous than those without; but it is more common in the coal measures of all countries to find a cylinder of pure sandstone—the cast of the interior of a tree—intersecting a great many alternate beds of shale and sandstone, which originally enveloped the tree as it stood erect in the water."

Many of the trees found in the coal measures have the tubes of a species of *spirorbis* or *serpula* (marine worms that cover themselves with an envelope or shell of limestone, and live within it), showing long immersion in salt or brackish water.

As regards the composition of the strata immediately covering the coal seams, Lyell says: "The more closely the strata productive of coal have been studied, the greater has become the force of the evidence in favour of their having originated in the manner of modern deltas. They display a vast thickness of stratified mud and fine sand without pebbles, and in them are seen countless stems, leaves, and roots of terrestrial plants, free, for the most part, from all admixture of marine remains—circumstances which imply the persistency in the same region of a vast body of fresh water."

We must remember that the thickness of these deposits above the coal seams is very great, from 600 to 12,000 feet in the British Isles. The theory favoured by Lyell, that the coal is formed by rafts of vegetable matter—like those of the Mississippi—brought down to the open sea and there deposited *at, or a little above, surface level*, demands enormous subsidences and upheavals, which could scarcely have occurred thus on the open sea-shore without completely marine conditions prevailing during some parts of the time. Besides this, a raft of pure vegetable matter as free from mineral material adulteration as ordinary coal, and extending over some hundreds of square miles, demands a very big river indeed. I read a paper on this subject at the Birmingham meeting of the British Association in 1865, and a very lively discussion followed, in which Sir Roderick Murchison, Sir Charles Lyell, John Phillips (the President of the year), and Principal Dawson took part. Lyell advocated the raft theory, and some amusement followed when this difficulty of finding a river big enough was raised, and was connected with his own published accounts of the probable insular conditions and climate of the period of the coal measures.

One of the most characteristic—I may say the specially characteristic—mineral deposit of the coal measures is that which the miners call the "linstey" or "linsey" rock, from its resemblance to the striped fabric, linsey, which is the usual material of their wives' skirts. It is a sandstone striped with dark, black lines due to fibres of carbonaceous matter. Some of these stripes are very thin. I hope to have an interesting illustration of this rock in my next paper. My explanation of the formation of this rock is that during the winter or other flood periods of its formation the white non-carbonaceous streaks were deposited in the fjord or lake, and that during other periods, when but little mineral silt was deposited, the vegetable matter from the wooded hillsides, was deposited through the comparatively clear water

near the shores (this striped rock does not appear to cover the whole width of great seams).

It should be noted that the explanation of coal formation above given does not at all contradict the received conclusions of geologists concerning the existence of swampy plains upon which grew the giant reeds, the tree-ferns, &c., found in the coal measures. These, according to my view, grew upon the sedimentary plains corresponding to the sandy plains, the *ör*, on which the upper ends of the Norwegian fjords terminate, and which, under the climatic conditions of the coal formation, would form just such plains as are ordinarily described. My only point of difference is that these were not the grounds upon which grew the scores or hundreds of generations of trees which must be accumulated in order to form a thick coal seam itself. That the conditions under which a seam of coal containing only 1 or 2 per cent. of mineral matter to 98 or 99 of vegetable origin was formed must be quite different from that in which was formed a mineral rock in which the proportions are reversed, 98 or 99 mineral to 1 of vegetable, is so obvious that it seems almost a folly to insist upon it. Nevertheless it is necessary to do so, as a mere inspection of the diagrams of the "coal fossils" usually printed prove, and the fact that most readers accept these as necessarily displaying the particular plants of which the coal itself is formed. If I am right, the coal itself was formed of trees and other vegetation of steep slopes; while the fossil specimens of the coal-measure rocks must consist of some of these (such as would be swept down during the deposit of the sediment), and of others of a very different character—viz., those which grew upon the swamps that were formed when the deposit nearly reached the water level. This reconciles the fact that we find conifera, which do not flourish in swamps, side by side with plants peculiar to swamps.

A DEAD WORLD.

By Richard A. Proctor.

THE ancients fell into strangely incorrect ideas about the heavenly bodies. They chose the most beautiful of all the planets, beautiful alike in symmetry of shape and delicacy of colouring, as the emblem of misery and gloom, regarding Saturday, the day sacred to that planet god, as one on which all work was unfortunate. They took, on the contrary, the most disappointing and unsatisfactory of all the sun's family, as a fortunate orb, the emblem of love; and although, strange to say, the day devoted to this planet (Friday) also, was deemed unfortunate for beginning a great work, or starting on a long journey, that was only because the next day, devoted to the unlucky Saturn, compelled rest; and it is naturally unlucky to begin a great work if in a few hours you will have to rest from it.

In like manner the ancients looked at the full moon, and because she was pale, and seemed so "silently and with so wan a face" to climb the sky, they thought she was cold. "Ice-cold Dian" she seemed to them at the very time when her surface, as modern science shows, is hotter a good deal than boiling water. I say this of the full moon in perfect consciousness that an American physicist, Mr. Langley, with an instrument which he calls the bolometer, finds the full moon colder than ice. I reject the evidence of that too delicate heat-measurer, and prefer the well-attested teachings of the trustworthy old instrument, the thermopile, whose work has been tested and measured again and again and never found wanting in correctness. With too delicate a balance, you do not always know what moves it; a breath may make some light substance you are weighing seem twenty times as heavy, or as light, as it really is. And so, I suspect, it has been with Mr. Langley's unpleasantly named heat-measurer. Some unobserved change near at hand has made the bolometer tell of cooling, where it should have told of heating if it had really recorded the influence of the moon's beams. Once an astronomer who supposed his delicate heat-measurements were telling him of the heat of stars, found that in reality he had been carefully measuring the heat generated by friction as he turned his telescope towards the star. Mr. Langley was making, we may be well assured, a similar mistake. Of course he thoroughly believes in the results he has obtained; so fully does he believe in them that, supposing the cold he has found in the full moon to result from the thinness of the lunar air, or the absence of any air on the moon, he adopted the belief that rock surfaces at a great height above the sea-level do not get warm under the sun's rays, as science asserts. It was on a lofty peak of the Rocky Mountains, report says, that he maintained this argument. "*A priori* reasoning," he said, "may seem to show that these rocks around us must become hot under the sun's rays, but science should trust more in *à posteriori* evidence, the argument from observed facts,"—here he sat down, but for a singularly short time, on one of the rocks to which he had referred—"I—I stand to it," he is reported to have continued, with some appearance of irritation, "despite of arguments, *à priori* or—or otherwise—that the moon must be intensely cold when she is full; for my bolometer says so, and my bolometer is never mistaken."

Sir John Herschel had long since shown, by a process of simple reasoning, that at the time of lunar midday the moon's surface must become at least as hot as boiling water. The present Lord Rosse, using one of the fine telescopes which his father constructed (not, as has been mistakenly alleged, the great Parsonstown reflector *), arrived at a result corresponding to that which any one acquainted with the laws of physics could have anticipated. He ingeniously separated the heat which the moon reflects from the heat which she radiates—that is, which she gives out as a warm body will. He found that the surface of the moon at lunar midday is 500 degrees hotter than the same surface at lunar midnight. (I mean degrees Fahrenheit, of course; for the general reader, however intimate he may be with the rules for converting Centigrade or Réaumur, prefers to have no occasion to apply them.) Dividing these equally—as is only fair—on either side of nothing, we have a range from 250 degrees below nought, or 282 degrees below freezing, to 250 degrees above nought, or 38 degrees above boiling! We may get less cold, by dividing unequally; but then we get so much the more heat, and that would be quite unnecessary; or we may get less heat, but then we get so much the more cold, and 250 degrees below zero would be cold enough in all conscience. The stoutest among us would be killed by ten seconds of such cold, as surely as he would be killed by one second in boiling water. The moon, which passes through the whole range of this

* "Along whose tube a tall man may walk without stooping," it is the custom to add. Doubtless, for a tunnelling along which tall men may walk conveniently, the great Rosse telescope is the best in existence. But regarded simply as an "instrument for observing the heavenly bodies," which perhaps is more nearly what it was meant for, the "mighty mirror of Parsonstown" is not so satisfactory. If Sir William Herschel's great 40-feet telescope "bunched a star into a cocked hat," Lord Rosse's still larger instrument played worse pranks still with the planets. "Zey show me somedings," said a well-known German astronomer, pathetically describing his experience at Parsonstown, "zey show me *somedings*, and zey say, 'He is *Saturn*': *and I believe zem.*"

change in a fortnight, is assuredly not a desirable place for creatures so unfortunately sensitive as we are to changes of temperature.

All this, however, is not new but old. Till Mr. Langley came and set many doubting with his dreadful bolometer, no one imagined that there could be life on a planet undergoing the vicissitudes of temperature which Sir John Herschel had correctly indicated, and Lord Rosse had demonstrated. That the moon, whatever her past history may have been, must now pass monthly through amazing vicissitudes of heat and cold, is certain, let Mr. Langley's bolometer say what it may. It is with the moon's past history we are concerned at present, not with these effects of the sun's action on the moon's dead body.

For dead the moon assuredly is, *now*. It is as clear that there are none of the characteristics essential for life—as water, air, and reasonable ranges of temperature—on the moon at present, as it is that her surface has in the past been the scene of tremendous disturbance. That dead body of hers, carefully examined, with due regard to the evidence which our earth also can give about planetary existence, may tell us as much as a post-mortem examination might tell the keenly observant anatomist of the past life of a human being. What may have been the precise features of the various eras of lunar life we may no more be able to tell than the anatomist can tell what thoughts passed through the brain which he dissects with his scalpel. But the broad outline of human life we may trace as surely as that anatomist can follow the stages by which the body he dissects had reached its final condition, before death invaded life's sanctuary.

It is here that, as it seems to me, new thoughts are suggested by knowledge recently acquired.

The argument from analogy has, I think, been somewhat too narrowly applied to the moon and other planets, when they have been compared with our earth. In assuming that each planet has its youth, its mid-life, its old age, and finally its death, astronomers have doubtless been right enough; but I think it by no means so clear that they have been right in assuming (tacitly, perhaps, but still confidently) that the various stages in the lifetime of one planet resemble the corresponding stages in the lifetime of another. A dog has stages of life corresponding to those of a man; but a puppy is not a baby or even like one, a young whelp is unlike a lad, a dog is not a human being, and even a dead dog presents no very marked features of resemblance to a defunct man.

I propose to consider here some points in which, most probably, the moon's life-history must have been entirely unlike the life history of our earth. The considerations I shall urge may be applied, it will be found, to other planets as well to those which are larger than the earth as to those which, like the moon, are very much smaller.

I begin with some of the simple considerations involved, such as those relating to size, surface, substance, and so on.

Every one knows that the earth contains eighty-one times as much matter as the moon. I might dwell on the consideration that in gathering together her larger mass the earth must have become very much warmer than the moon ever was, even when the moon was at her youngest and hottest. For the celestial bodies owe their heat to their own energies in gathering their mass together; and the greater the gathering energy the greater the developed heat, as certainly as the stronger a blacksmith's arm the greater the effect of his blows.

It would seem even that we have evidence of a still greater deficiency of original heat in the circumstance that the moon not only had less energy with which to gather together her substance, but that having gathered it together, she has packed it less closely than the earth. If the moon were as compact as the earth she should have only an 81st part of the earth's volume. As a matter of fact she has fully a 49th part. The earth put in a suitable balance (I cannot indicate any suitable place for setting it) would be found to weigh about five and a half times as much as a globe of water of the same size. But weighing the moon, three and a half globes of water as large as the moon would bring down the scale on their side.

Starting thus in her career of life with much less heat than the earth, the moon would cool also much more quickly. I do not mean by this that she would give out more heat moment by moment than the earth did at the same stage of her life; but that she would be cooling faster in the same sense that a cupful of hot water cools faster than a bowlful, and a spoonful faster than a cupful. This is easily seen if we compare the moon when red-hot with the earth also red-hot, neglecting the effect of the air of either body in keeping in the heat, as clothing keeps in the heat of the human body. We may be sure that the consideration thus neglected does not affect the general result; for certainly the moon was not better clothed (atmospherically) than the earth, at any corresponding stages of their lives—but the reverse. Our red-hot earth, then, had eighty-one times as much heat at that red-hot time than the moon at that (other) time when *she* was red-hot. And the earth was giving out thirteen and a half times as much heat, moment by moment, as the moon; for in that degree her surface exceeds the moon's. Now, if a man has 81,000*l*., while another has but 1,000*l*., and expends daily 13*l*. 10*s*., while his poorer friend can only afford to expend 1*l*. daily, the property of the former will last six thousand days, while that of the latter will, in one thousand, be completely exhausted. The richer man's money would last six times as long as that of the poorer man. The earth's heat would, in the same way, last six times as long as the moon's, at each stage of the cooling process.

In this way the moon would manifestly age very fast as compared with the earth. If we imagine the moon and the earth at the same stage of planet life six millions of years ago, then in a million years from that time, or five millions of years ago, the moon was where the earth is now. What will five millions of years do for us, or rather for our home? But even that way of putting it is not quite strong enough. Those five millions of years in the moon's history would correspond to six times as long—or to thirty millions of years—in the history of the earth! Our globe will show marked signs of advanced age by the end of that time, I venture to predict, in calm assurance that, at any rate, I shall not be contradicted by the evidence of observed facts. She would then be as far advanced in planetary life as the moon.

Like the well-known calculation about wine, made under (pretended) vinous influence for *All the Year Round* several years ago, this calculation may be modified, yet the result come out unchanged. If I remember rightly, that calculation began: "Let us suppose there are eighty casks, or it may be eight hundred, or, perhaps, eight thousand," and so on. We might have begun our calculation by saying, Imagine the moon and the earth at the same age six millions, or it may be sixty millions, or perhaps six hundred millions of years ago. It really does not matter. Take the longest period. Six hundred millions of years ago the earth and moon were in the same stage of planetary life. Then we find that five hundred millions of years ago the moon had reached the stage now reached by the earth, and three thousand millions of years hence the earth will have reached the same condition as the moon. Is not this, the

reader may ask, a very different result from the former? On the contrary, it is precisely the same result! For, by our present assumption, the rate at which either planet ages is only one-hundredth of the rate we had before assumed. Hence the three thousand millions of years in our result indicate an amount of aging equivalent only to that resulting in thirty millions of years according to our former assumption.

Since, then, we are quite certain of this, that the time when earth and moon were equally advanced in planetary life must be set millions of years ago, we are at least certain also of this, that our earth will not be so old as the moon now is, she will not be so wretchedly decrepit (if not so utterly dead) a world until many millions of years have passed.

So far as this reasoning is concerned, the moon might have passed through a life much like that of our earth. She might well have had a life-bearing period akin to that through which the earth is passing at present. True, the various stages of her life would be very much shorter, and we can very well believe that, therefore, the various forms of animal life which have been developed on the earth would not have had the same chance of being properly developed on the moon. Or, considering the progress of a single race —our own—we can very well imagine that a being like man on the moon would not have had sufficient time to pass through all the stages by which man has passed from the arboreal, hairy, pointed-eared, and four-legged ancestry now assigned him, to the civilised man of to-day, inventing every year more perfect instruments for destroying his fellows. The Lunarian, thus understood, may have been no better fighter than the man of the caves, or even than the more advanced fighters among the anthropoid apes, our cousins. In other words, he may have been a perfectly contemptible creature, instead of a being of murderously imperial instincts.

But now a consideration comes in which suggests the idea that at no time could the forms of animal and vegetable life on the moon have resembled those on the earth. We must apportion to the moon no more than her fair allowance of water, no more than her fair allowance of air. And when we have done this, we find strong reason for thinking that, though that allowance of water and of air may have done very well for the Lunarians, it would not have done at all for us.

Let us begin with the water. The moon would have had one eighty-first part of the quantity of water which formed our earth's share. So far, good. That seems altogether fair. But observe. Our earth, with eighty-one times as much water, had a surface only thirteen and a half times as large over which to distribute that water in seas. It needs not even the ghost of Cocker to show that the earth had six times as much water per square mile. That of itself must have sufficed to make a very marked difference between the moon's condition *then* and our earth's condition now. Nor does it seem at all likely that at any stage, either earlier or later, the moon would have had a better chance of doing well in the universe than she had then—that is, at the time when she had reached the same stage of cooling which the earth has reached now.

But the want, or the short allowance, of water was as nothing compared with the thin air the Lunarians, if there ever were any, had to breathe.

Of course, as regards quantity of air, the reasoning is the same precisely as for water. Only one sixth part of the quantity of air which we have on this earth per square mile was (on the average) above each square mile of the moon. On the earth this would be a most serious matter. For the density of air depends on the weight of the total quantity above the surface; so that the density of the air would be reduced to one sixth part if the quantity of air above each square mile were no greater here than it probably was on the moon, in the corresponding part of her planetary life. Now in the highest ascent above the sea-level which men have yet made—the celebrated balloon ascent by Messrs. Coxwell and Glaisher—the height attained was within a very few feet of the height of Mount Everest, the highest known peak of the Himalayas. At that height the air was reduced to little more than one-fourth its density at the sea-level. Mr. Glaisher fainted, and, if he had been alone, it would have been all up with him, even though the balloon might eventually have come down. Mr. Coxwell remained conscious, however. Nay, with creditable zeal for science, he even urged the fainting meteorologist to "make one other little observation, now—*do*," to which, however, Mr. Glaisher only responded by fainting dead away. Mr. Coxwell began, he tells us, to feel rather blue. Looking at his hands, he perceived that they were quite blue. They were also powerless, which was an even more serious matter; for it was necessary that the valve-strings should be pulled, if the conscious and the unconscious aeronauts were to be saved. Mr. Coxwell was equal to the occasion. Seizing hold of the valve-string with his teeth, he drew it—feebly indeed, but still so that it worked—and the balloon began to descend. He had saved himself and his companion, but only as by the skin of his teeth. Certainly this proved that no man could live, even for a few minutes, in air of only one-sixth of the density of the air at our sea-level—for that would be but two-thirds as dense as the air whose rarity so nearly killed our aeronauts.

Even this, however, would be as nothing compared with the tenuity of the lunar air, if we are right in supposing that, at the corresponding stage of her planetary life, the moon had the same allowance of air as compared with her mass that our earth has now. For, the smaller quantity of air would be drawn down with smaller force, gravity at the moon's surface being only one sixth part of gravity at the surface of our earth. Instead of the lunar air having one-sixth, it would only have one thirty-sixth, of the density of our air at the sea-level. Air so thin would not only be unbreathable by creatures like ourselves; it would not support any kind of life known to us on earth, except such life as there is (if life it can be called) in rotifers and other such creatures, which can not only live with the smallest possible allowance of air, but resist with apparently unimpaired cheerfulness the action of a roasting heat and a much more than freezing cold, and can neither be boiled nor baked, nor drowned nor desiccated, to death.

Consider, again, some of the unpleasant results of such extreme rarity or tenuity of the air. It may seem rather a convenience than otherwise that the mercurial barometer would be only five-sixths of an inch in height. But the water barometer, instead of being, as with us, about thirty-three feet in height, would have a height of less than one foot. Now this in itself would not signify, but it would mean (and this *would* signify) that one foot would be the extreme height to which a suction pump would raise water. What a nuisance that would be! especially, too, where, as we have seen, water would not be very plentiful, and wells would have to be dug deeper than on the earth to reach it. Then drinking would be much more difficult—which might, however, be as well, where water would be so hard to get at—for in drinking we exhaust the air on one side of the water in our drinking-vessel (the air inside the mouth), and the air on the other side (outside the mouth) obligingly presses the water into the mouth, where we want it to go. But the air outside would not do this with sufficient energy if its density were reduced to one-sixteenth; so that, in order to drink, one would have to tip the drinking-vessel up till

XUM

the water ran out into the mouth, which would be, to say the least, an inelegant and unseemly way of drinking.

In passing we may notice that, were it not for the unpleasant deficiencies here mentioned, creatures much larger than any on the earth might exist on the moon. A Brobdingnag on the earth would be by no means the terrible monster imagined by the inventive Captain Gulliver. From what is now known about the relation between the strength and the size of muscles, a Brobdingnag ten times as tall (and also ten times as broad and as thick) as a man, would be one hundred times as strong; but he would be one thousand times as heavy. Thus he would be ten times as heavy as he ought to be, and would be just about as active as a man among ourselves who, weighing 140 lbs. (10 stone), had his weight increased by overloading to 1,400 lbs. The extra 1,260 lbs., or rather more than half a ton, would certainly not conduce to activity, insomuch that, when Gulliver first saw a Brobdingnag, he might have been sure that the creature's show of giant size must be hollow, or else its weight so great that movement would be impossible. Now on the moon such a Brobdingnag would weigh only 233⅓ lbs., and, so far as power of movement is concerned, would be like a man of 140 lbs. weighted down with only 94⅔ lbs. Even this would be an awkward extra weight. But a lunar man six times as tall as one of ourselves would be all right, for he would be thirty-six times as strong, and also thirty-six times as heavy, so that he would be just as active as one of us. He would be no such contemptible giant as Jack the killer of giants dealt with so easily. He would stride six yards as easily as a man on earth strides one yard; he could leap over a height of 24 feet as easily as an active youth leaps over a four-feet stile. The work he could do as a lunar engineer or road-maker would be something stupendous. With as much ease as a man on earth can raise a block of stone six inches in length, height, and breadth, our lunar man could raise a cubical block one yard in the side, for such a block which on the earth would be 216 times as heavy, would on the moon be but thirty-six times as heavy, and the lunar man would be thirty-six times as strong. A lunar Great Pyramid, representing the same amount of work as the Great Pyramid of Egypt, would be 1,500 yards in the side and 970 yards high. It would remain in the dry, thin air of the moon for as many hundreds of thousands of years as our Great Pyramid has lasted thousands; and as it would be quite easily discernible with our telescopes, even with those of moderate power, there might, after all, be nothing very stupendously absurd in old Gruithuysen's idea that some of the features on the moon were the work of former lunar inhabitants. But unfortunately, these large lunar men would have wanted plenty of air and plenty of water, especially when at work on great lunar edifices; and if our estimate of the moon's past condition is sound, there would have been but very little water for them and still less air.

Perhaps all this may seem very little worth considering. Of such speculations there is no end, said Sir John Herschel—after indulging in them to his heart's content. And certainly it seems somewhat idle to discuss the ways of lunar men, when we have every reason to think that, in a world whose various stages of life lasted so short a time as the moon's, no such creature as man could possibly have been developed, even if there had been the requisite supply of air and water. Let us rather consider, therefore, whether what is actually seen on the moon may not find its explanation in the circumstances we have been examining.

(To be continued.)

EXAMPLE OF RECENT CELESTIAL PHOTOGRAPHY.

WE give this month a process engraving from a photograph by MM. Paul and Prosper Henry, of a rich region of the constellation Cygnus. It may be said to have been engraved by the stars themselves, the original photograph being the direct work of the stars, and the present reproduction derived from that photograph without the intervention of any human handiwork.

Next month we shall give process copies of the photographs of the Pleiades by the same astronomical photographers, showing the nebulous masses around Merope and Maia, accompanied by drawings of the same regions as observed by Tempel and Wolf.

HOW THE BIBLE CAME TO US.

By a Student of Divinity.

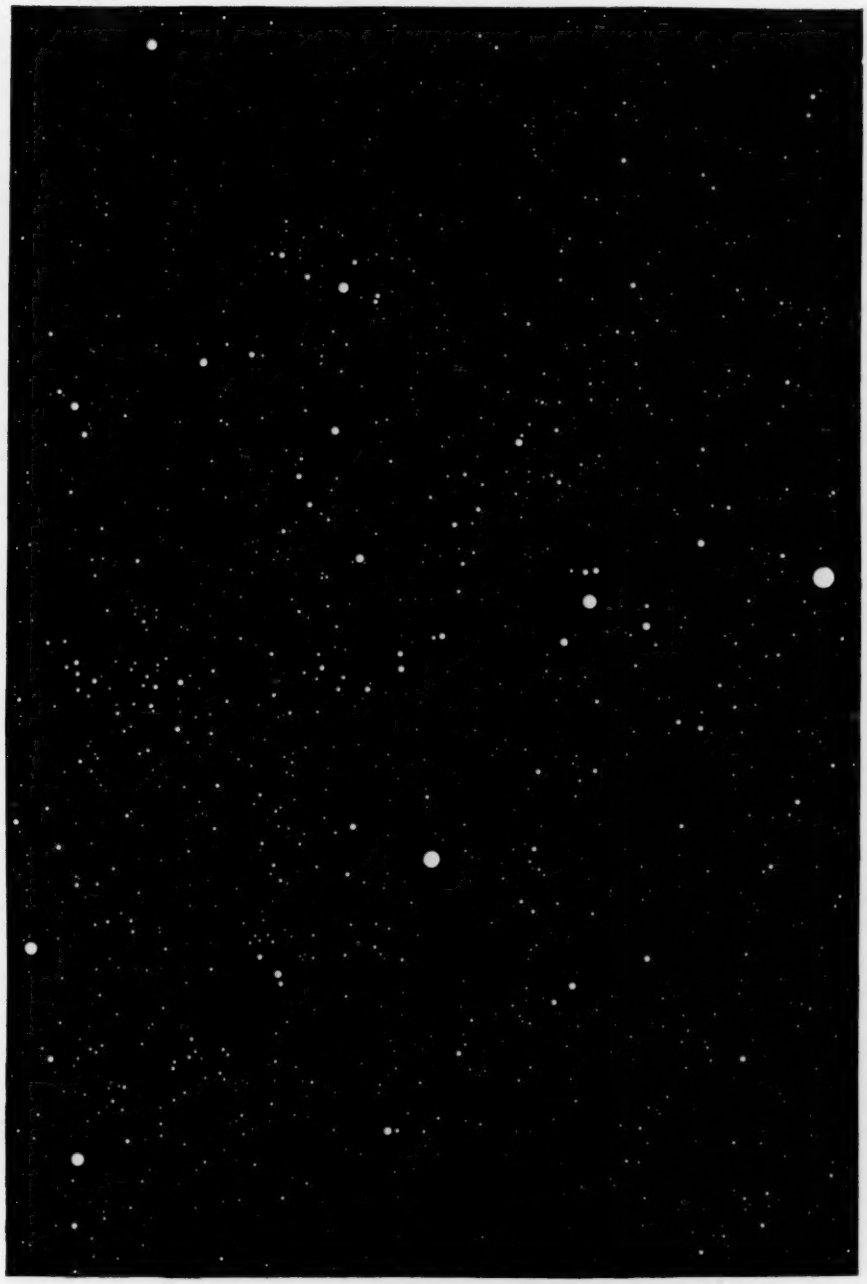
IT would be interesting to learn the average opinion of Bible readers about the *nature* of the Bible. Even in these days we take it that ninety-nine out of a hundred—nay, the full hundred out of nine hundreds in ten—regard the Bible as a book whose two parts, the Old Testament and the New Testament, form complete records, one given as a revelation to the Jewish people, the other as a revelation to the Gentiles. Fully as large a proportion of Bible readers, if further asked *why* they regard the Old Testament and the New as alike God's Word, would have no answer ready, except that it would be sinful to doubt it.

The real facts—let the interpretation of them be what it may—are somewhat different from what those imagine who are most earnest in talking about the Bible, but care least to learn what it really is.

Up to the time of Josiah, thirteenth in descent from David, there was no recognised collection of sacred scriptures other than what was called the Testimony, described in Deuteronomy xxxi. 12 as "the Book of the Law, put in the side of the ark of the covenant of the Lord." Probably the Testimony was simply the Decalogue, and those warnings and exhortations Moses had been enjoined at sundry times (see Exodus xvii. 18) "to write for a memorial in a book, and rehearse in the ears of Joshua." This Testimony, whatever it included, was given to each king at his crowning, and doubtless, before the kings' days, to each ruler at his appointment. And as, in our times, each monarch at his coronation hearkens to a certain more or less solemn statement of his duties, and as solemnly undertakes to fulfil them, so the judge, and later the king of the Jewish people, accepted the Testimony in token that he meant to obey its injunctions. It is not recorded that most of the kings fulfilled their promise in this respect,—rather the reverse.

In the days of Josiah the Book of the Law was found in the Temple by a certain priest, Hilkiah, who delivered it to a scribe, Shaphan, who, in turn, read it to the king, who was very much troubled to find that the things enjoined in this Book of the Law had been very much neglected—the cause, he at once saw, of the troubles which had fallen on the Jews for a long time past. (In those days they always knew how "bad times" were brought about.) So the king sent Hilkiah and Shaphan, with others, to Huldah, a prophetess, or "wise woman," of the sibylline type. This lady oracularly interpreted the whole matter. At her suggestion

The Centre of this Region is in Right Ascension 19h. 55m., North Dec. 37° 45′.



PHOTOGRAPH OF A "RICH REGION" IN THE CONSTELLATION CYGNUS.
(Three Exposures of One Hour.)
Reproduced by a Photographic Process without Hand-Touching.

the Book of the Law was read to the people; the priests who had been ordained in Judah to burn incense "to the sun, the moon, the planets, and the stars" were put down; "the chariots of the sun," whatever they may have been, were burned, and "the horses given by the kings of Judah to the sun" were taken away; the priests of the high places were slain and men's bones were burned upon their altars (to defile them); the wizards and mediums ("those that had familiar spirits"), and the teraphim or ancestral idols, were put away. Everything, in fact, was done to appease the anger of Yahveh-Elohim, though unfortunately without avail; for we read that, "notwithstanding, Yahveh turned not from the fierceness of his great wrath wherewith his anger was kindled."

Around the Book of the Law, so long neglected, and freshly brought out under these striking circumstances, other old records were collected—we know not by whom. Whether they had the authority of Hilkiah the priest or Shaphan the scribe, or Huldah the sibyl, for their authenticity as the inspired work of God, no one knows.* We know only that they were the remaining books or documents forming the Pentateuch and the story of Joshua's victories. Even at this stage, however, diversities of opinion existed as to the value of the several records. The Samaritans accepted the Pentateuch and rejected the Book of Joshua. One would like to know their reasons in detail. Unfortunately we do not. We know only that during the two centuries between the time of Josiah and the time of Nehemiah the sacred documents had increased considerably in amount; for Josiah could hardly have read the whole Pentateuch, as we are told he actually did read the discovered Book of the Law, aloud to all the people.

One would like also to know who they were who during these two centuries weighed these other documents, and were moved to pronounce them God's own word. Let us at least hope that thoroughly trustworthy opinions were pronounced on that point in that age, uncritical though it was. For if not, we have to rely on opinions formed by men who in later times, with greater acumen, and perhaps wider knowledge, had also too personal an interest in the matter to be entirely free from the possibility of being biassed. A rather serious difficulty arises, of course, from the consideration that much of the material subsequently included among the sacred writings (God's very own Word!) must have existed in the time of Hilkiah, the high priest, and Huldah, the wise woman, and yet somehow failed to be recognised by these experts (may we assume?) as inspired.

Time passed, and again the Book of the Law was read to the people. It was after the restoration, and the time was that of the Feast of Tabernacles. Since the days of Joshua, the son of Nun, we are told, this feast had not been kept as it should have been; but now the people made booths, as had been enjoined—probably in far earlier times than even the priests themselves suspected. They did this because now the fuller law had been read to them by Ezra, as Nehemiah relates, with interpretation (popularised as it were), and the people had been much moved when they heard it.

This "revival," as Mr. Matthew Arnold calls it, brought into the canon the Pentateuch and the Book of Joshua. Doubtless the Book of Judges, and the Books of Samuel and Kings, then existed; but the glamour of antiquity and mystery had not yet surrounded these and other documents in the Temple chests, so that as yet it had not been discovered that they were written by divine inspiration. We know, in fact, that Nehemiah started a library, which probably he regarded as altogether secular. He put into it (2 Maccabees ii. 13) works which he had collected outside the Book of the Law and Joshua, viz. "matters relating to the kings and the prophets, and David's matters, and letters to the kings about offerings."

When a sufficient time had elapsed, it was discovered that these documents also were inspired—all except the letters to the kings about offerings. So *they* were included in the growing canon of the Old Testament. This was not done on Nehemiah's authority; nay, he may be said, by omitting to include them among the sacred books, to have practically excluded them, just as Hilkiah and Huldah had to all intents and purposes excluded still older books which later became the Holy Scriptures.

The new matter thus added to the Bible included the Books of Judges, Samuel, and Kings; the books of Isaiah (or, rather, of the two Isaiahs), Jeremiah, Ezekiel, and the twelve minor prophets; and the Psalms,—not all of them David's, but all so far associated with his name as to be called "David's matters" (*τὰ τοῦ Δαβίδ*).

Judas Maccabæus is responsible for the next addition to the sacred Scriptures. Among "the things lost by reason of the war we had," were the Books of Daniel, Job, Proverbs, and other documents, including all those which the Protestant Bibles add to the books already mentioned. A strange feature in the list of additions thus made is that while it included books like the Proverbs, the Song of Solomon, and Ecclesiastes, which must have been known in the time of Hilkiah and Huldah, and must have been old lore to Nehemiah, so that they had been practically rejected for centuries by all the leading religious folk as certainly not inspired—whatever other excellent qualities they might have—it included also the Book of Daniel and others which were actually contemporary with the introduction of the new series. This series closed, and still closes, in the Hebrew Bible, with the Books of Esther, Daniel, Ezra, Nehemiah, and Chronicles, an arrangement which very suggestively indicates the value assigned to the last three books by those who thus included them in the sacred canon!

There the record for the Old Testament ends. One can readily see, however, that the books written by Jews during the next two centuries would have been added in due time to the canon, if misfortunes had not unhappily interrupted the development of the holy Jewish scriptures. The mere fact that the Greek Jews wrote in Greek and not in Hebrew would have made little difference to the Jewish people, who until the fall of Jerusalem had a rare faculty for regarding all the writings by men of their own race as inspired! The Books of Baruch and Tobit, Wisdom, Ecclesiasticus, and the two Books of the Maccabees, will bear comparison exceedingly well with the Books of Esther and Daniel, the Song of Solomon, Proverbs, and the two Books of Chronicles. Of course, to those who regarded the Hebrew language as specially sacred, as the language in which Yahveh-Elohim talked with Adam and Eve, with the Serpent, and (see Job) with Satan, the idea of including Greek books in the sacred canon must have appeared outrageous; but if the Jewish nation had but survived a century or two longer, the books of the Apocrypha would have taken a permanent place in the Old Testament. In fact, remembering that the Greek and Roman Churches include these books, while the Armenian Church includes the Book of Enoch, we are obliged to admit that the action of the English Churches in excluding them is somewhat perverse. Especially puzzling is the *crux* presented by the Epistle of Jude, long doubted, but now accepted as canonical; for this epistle quotes from the Book of Enoch as from

* We do not know how Hilkiah, or Shaphan, or even the wise woman Huldah, came to be infallible judges of what should be regarded as the Word of the Infinite, or why they held in less esteem the books which Nehemiah subsequently accepted as inspired.

Holy Scripture! Either Jude's epistle is God's inspired word or it is not. If it is, then so is the Book of Enoch, which he quotes as authoritative, saying that so Enoch "*prophesied*;" if it is not, then this epistle has no proper place in the canon of scripture. The Armenian Church alone, by boldly accepting the Book of Enoch, escapes this difficulty.

Such is the record of the canon of the Old Testament from the time when Moses received the ten commandments (written—as he says he actually witnessed!—by the finger of God, on stone), and wrote special injunctions, according to God's command, for the destruction of non-Jewish nations, to the time of Hilkiah the priest and Huldah the sibyl, thence to the time of Nehemiah and Ezra (whose testimony, however, cuts rather inconveniently both ways, supporting some books and opposing others), and onwards to the time of Judas Maccabæus, so far as Protestant Bibles are concerned, while we pass on a few centuries farther for portions of the Roman, Greek, and Armenian Bibles.

Surely a collection of books thus formed must be full of interest to all thinking minds. The student of science finds in these books an account of very ancient ideas about many of the subjects with which he deals; the student of history has here most valuable records; the student of literature and even the student of art have here a fund of valuable materials. To the reverent mind the thought of calling this rather incongruous collection the word of GOD may seem somewhat startling. Such a mind may even feel pained at the suggestion, and may shudder at the callous ease with which the less reverent assume that not only what is good and true and beautiful, but also what is cruel or crude, absurd or trivial, indecent or erroneous, nay, even what is obviously self-contradictory, in this collection of all that remains of Jewish literature before the capture of Jerusalem, came from the Being that they describe in the same breath as All-wise, All-merciful, All-pure, All-perfect. But the very incongruity of their ideas should prevent us from regarding such men as irreverent, still less as irreligious or wicked. Nor need we fear that a nation among whom are many of these unconscious, and therefore innocent blasphemers, must needs arouse the anger of Yahveh-Elohim. All things work according to law, and the Power from which all things proceed will not turn from uniform procedure according to law to acts of violence and injustice—as if that Power were "some angry man in the next street"—merely because the unwise proclaim their folly loudly. Their offence, in any case, is only against the principles of logic; and though, were their minds clearer, it would be profane and hideous blasphemy, we need not fear lest

> Some hysteric sense
> Of wrong or insult, should offend the throne
> Where Wisdom reigns supreme.

The books of the later covenant with which we have next to deal present a problem of another sort. We have here nothing like the range in time, nothing like the variety of subject, and nothing like the incongruity of method and of treatment which we find in the ancient Jewish collection.

This portion of our subject must be left, however, to another occasion.

(*To be concluded.*)

After formulating a dozen inconsistent explanations of some manifest and perfectly natural mistakes in ancient religious records, the weaker theologians proclaim that the difficulty has been long since met. One recalls a scene in *Punch* many years since where a defender of American honour, speaking of Pennsylvania bonds, says:—

> This debt we have *repudiated* long ago,—
> 'Tis therefore *settled*,—yet thisyer Britisher
> Keeps for *repayment* worriting us still.

PRIZE-PIG HONOURS FOR SCIENCE.

By RICHARD A. PROCTOR.

MR. RANYARD found himself a long way in advance of his time when he brought before the Astronomical Society a proposal for doing away with the award of medals in recognition of scientific work. He was told that the idea was revolutionary, and that a medal, though not inappropriate for a prize pig, is also a graceful recognition of researches supposed to be pursued with the object of increasing knowledge.

I was formerly outspoken for Mr. Ranyard's side of the question, but events which happened in 1872–73 rendered my advocacy of the more dignified view of the matter less easy to me than before. For in 1872 Sir Edmund Beckett (whom I then barely knew by sight, but later reckoned among my most esteemed friends) thought fit to put forward my own name for the prize-pig form of recognition I had objected to; and as the award was not confirmed a sort of sour-grapes tone might be suspected in any comments I might thereafter make upon the medal subject in my former manner. Yet, as the subject has been raised again by another, who is as certainly free from any such suspicion as my friends know me to be, I shall venture to make such remarks upon it here as experience and judgment alike suggest.

To outsiders it seems a very simple matter. Certain men are at work in various ways in astronomical research; a society of students of astronomy recognise special interest or value in certain of their results, and, selecting what they consider best, the society awards the only form of recognition which it can think of.

In actual practice, however, the matter is not so simple. This particular form of recognition, like others—as election to various offices in the society, and so forth—very readily lends itself to jobbery. Two men may agree to support each other alternately for—let us say—the presidentship of a learned society, an office which may be merely complimentary, or may be used as a stepping-stone to salaried posts. The presidentship of the Astronomical Society, for example, is not an office of emolument; yet it might conceivably be worked to transfer the master of a suburban school into a University professor, or in other ways to advance one who had little power to advance himself. So with the award of a medal. Directly of no value, such an award may be indirectly made very profitable. One often finds, indeed, the same persons who job in regard to office engaged together in regard to even so seemingly innocent a matter as the award of a medal.

But apart from jobbery, the award of a medal may be made—unfortunately often is made—a subject for quite other than scientific considerations. In the case, for instance, of the suggestion made in regard to myself, I fancy that more than one of those who supported me were partly, though perhaps unconsciously, moved by the thought that, if the medal were given to me (my work over the transit of Venus being included with stellar researches, then incomplete), it would be unpleasant for the man whose transit investigations I had unfortunately found unsatisfactory. This, of course, was an altogether wrong reason for voting in favour of the award. But of course the same consideration afforded an equally wrong reason for voting against it—though definitely urged in that direction, and, indeed, the consideration by which the five unfavourable votes were secured. This, however, was a mild case compared with some which have occurred. Indeed, remembering that the original object of medal-giving was to do something pleasant and graceful—not necessarily scientific—I can

see good reason why a medal should not be given if there is any chance that its award to one man will give pain to another, as in my case would admittedly have happened. But when we consider how recognition has been refused to Young, Draper, Secchi, and others, for no better real reason than that they had succeeded where others had failed, or that they had established results which others had long and persistently, not to say perversely, opposed, then we cannot but see that there is something risky about the fat-pig-prize system as applied to scientific research.

Then again, a medal may be used to discourage as well as to encourage scientific workers. It is effectively used in that bad way when the medal is given (as it nearly always is) to men who, either as observatory chiefs or as men of large wealth, are able to obtain important results independently of their individual exertions. A man writing alone, perhaps also contending against the constant pressure of the *res angusta domi*, may be making much greater sacrifice for science, though obtaining much less showy results, than one who can employ a section of a large staff to carry out investigations which he has only planned or perhaps planned so imperfectly that only as the work of subordinates has a correct method of research been developed. A man with twenty thousand pounds a year may, without any real sacrifice, devote five thousand a year to a scientific inquiry, and with most impressive results (obtained by "my assistants"), where another, with nothing a year but what he earns, may barely be able to secure a tithe of what he aims at, though sacrificing hours worth two-thirds of his income to his work. If, in awarding the fat-pig order of prizes, societies only encouraged the former class, all would be well. But, unfortunately, they manage to discourage the other class. To him that hath they give freely; from him that hath not they try to take even that which he seemeth to have.

Of course only the weak are thus affected. But men writing under great difficulties, and trying to work alone, are apt at times to *be* weak. Many know the feeling, and, not only know it, but have yielded to it. I could name half a dozen at least who have begun original work, and would have gone on with it if simply left alone; but when scientific bodies have pretended to examine their work, and, seeming to put it in the balance, have appeared to find it wanting (though perhaps it has been of so special a kind that not one of those who thus pretended to weigh it has known anything about it), they have been discouraged and have turned to other pursuits. As an instance, I might mention a department of solar research, from which one once active worker has entirely seceded because of precisely such discouragement as I have indicated.

The same may indeed be said of many of the so-called distinctions for which the weaker sort hanker. Take, for instance, office on the council of a society. This ought to be simply a matter of service. "We want the help of such and such a man," a society should in effect say, "and, if he is willing, we will get him to join our working council." But instead of that, we find office on the council regarded as a sort of distinction, and all sorts of small feelings at work in deciding whether a man shall be elected or rejected. I shall not easily forget, for my own part, the surprise and disgust with which, after sitting on the council of the Astronomical Society several years, and consenting at a great sacrifice to work as one of its secretaries, I found that I had unwittingly hurt the feelings of a number of others, who regarded me as stepping over their heads into those much-coveted offices. Very quickly, thereon, did I withdraw from all such interference with their happiness. But it ought not to be so.

And see how easily this unfortunate state of things may be worked to cause pain and annoyance, nay, even to seem to cast a slur on a man's ability or on his work. At the last election for the council of the Astronomical Society, three marked cases of the kind occurred. Mr. Warren de la Rue and Captain Wharton, Chief Hydrographer to the Admiralty, are both put on the list for election to the council; an opposition list is sent forth, and both are rejected. How can outsiders fail to draw the entirely erroneous inference that the decision indicated an opinion adverse to their merits on the part of the whole society? Then in the opposition list Sir George Airy is advanced as a candidate, and is not elected. This, which looks like a slur, has in reality no such meaning. But there is undoubtedly discouragement in such action on the part of a body supposed to represent astronomy in this country. I am for my own part satisfied that the influence of scientific societies is too often worked so as to tend more to the discouragement than to the advance of science. And I am confirmed in this belief by noting that not one series of scientific researches of any importance has attained success through the influence of any scientific body, or has even been materially helped by such influence.

ANALYSIS OF GENESIS.*

WE hail with pleasure this new translation and analysis of one of the most ancient records in existence. The Cuneiform inscriptions include some records far more ancient than the Book of Genesis, and there are Egyptian records which belong to still more remote times, but in the Book of Genesis documents of venerable antiquity are quoted. To the Pentateuch, says Matthew Arnold justly, many an old book had given up its treasures and itself vanished for ever. Writing "record" for "book," this is specially true of the Book of Genesis. No one can read it carefully through, even in the imperfect (though charmingly written) Authorised Version, without seeing that it is most complex and, as it were, variegated, in character. We seem to feel the sense of reverence with which the old collator of documents and records preserved in the sacred lore chests of the Temple went through their varied contents. Conscious as he must have been of their many contradictions, noting as he must how the same story was related of different persons, or different accounts given of the same events, he could not venture to excise or abstract. Believing all to be sacred, because most ancient, he puts all in, in such order as seemed to him least likely to bring the different records into manifest contradiction.

We cannot but sympathise with the sense of reverence thus shown. It is akin in character to the reverence with which many a man as years advance and knowledge grows regards the ways and thoughts of his parents and grandparents, conscious that in many respects the ideas they taught him were inexact, but unwilling to admit that consciousness even to himself and prepared to conceal it closely from all others.

Yet to us this willingness to be blind to ancient mistakes appears, when looked at aright, as after all a weakness. It is such a weakness as we often see in individual life, when the confident receptivity of the child is allowed to remain a characteristic of the grown man. We know now that knowledge was not altogether with the men of old, but

* The Book of Genesis: a Translation from the Hebrew, in which the constituent elements of the text are separated; to which is added an attempted restoration of the original documents used by the latest reviser. By François Lenormant. Translated from the French, with an introduction and notes, by the author of "Mankind: their Origin and Destiny." London: Longmans, Green, & Co.

grows from more to more, even while showing us as it grows how little it must ever be compared with the unknown. In this lesson, indeed, we see that wisdom as well as knowledge is ever growing from more to more, for in the consciousness of limited knowledge there is wisdom, while in the confidence of ignorance there is childlike folly.

Man of to-day is ready, being grown, to put away childish ideas. He feels free, being free born, to examine the ways and thoughts of old times; to see the real value of ancient records such as those collected in that Jewish library called the Old Testament. From them we learn how man progressed from semi-savagery towards civilisation, and in particular how those ideas which we call religious had their origin and development.

It is hardly necessary for us to remark that here the Book of Genesis can be viewed from no theological standpoint. We claim freedom to regard it as we would any other ancient work or collection of works. But, apart from all the theological questions which have become associated with the older books of the Hebrew Scriptures, there is a deep, though somewhat quaint, interest in reading these ancient records. They present problems of great difficulty, because of the strange way in which the editor or editors, who, after the exile, arranged the Pentateuch as we know it, worked into the various books the somewhat incongruous materials in their hands. It requires no close scrutiny to determine generally what is Babylonian, what Egyptian, in the portions of the Book of Genesis which are really foreign and have manifestly been only adapted to Hebrew history and Hebrew ideas. But this is only the beginning of the task of determining the origin of the various parts of that old book; for we have Hebrew records of matters strictly Hebraistic, wrought into one and the same book, with purely Egyptian and as purely Babylonian conceptions, and also obviously recorded at widely-different times in the development of the Hebrew race. Then we have passages the origin of which, and the date to which they must be referred, seem altogether to baffle conjecture, at least in the present state of our knowledge.

It may be said that on the whole the easiest parts of the Book of Genesis to interpret are those which relate to matters absolutely outside the history of the Semitic race. For here the traces of adaptation are obvious, and indeed it here matters little whether they are obvious or not, because we now know that the record has here been derived essentially from without. Moreover, the post-exilian editors have been at very little pains to harmonise the diverse records. They probably knew that the people for whom they collated the work would not be unduly critical; and they did not know, nor would they perhaps have greatly cared if they had known, that alien races, the Gentiles whom they were taught to hate as a religious duty, would one day be reviling, execrating, and persecuting each other over questions arising from the interpretation of the crude and fantastic notions of the Egyptian and Babylonian persecutors of the Jewish people.

Among the portions of Genesis which can thus be now referred to their separate origins, the cosmogonies woven into the beginning of Genesis, and the history of the Flood, may be specially cited.

It is clear that in the first two chapters of Genesis as now arranged we have two entirely distinct conceptions of creation. The one which comes first in Genesis belongs in reality to a far later time than the other. The earlier account is commonly described as the Jehovistic, while the later is called the Elohistic, because in one the creating and arranging power is spoken of as Yahveh-Elôhim, while in the other it is called Elohim (a plural form not necessarily involving a plural idea); but it should be remembered that these names were alike Hebrew in origin (though Yahveh was probably the god of the Hittites). The Egyptian and Babylonian traditions were doubtless Hebraised by those who originally transcribed them (the Egyptian traditions long before the Babylonian), and retained their several forms when collated after the exile.

The older record is obviously Egyptian in origin. It runs, as translated in the book before us, as follows:—

"In the day that Yahveh Elôhîm made earth and heaven, no bush of the field was yet in the earth, and no herb of the field had yet sprung up: for Yahveh Elôhîm had not caused it to rain upon the earth, and there was not a man to till the ground: but there went up a mist from the earth, and watered the whole face of the ground.

"And Yahveh Elôhîm formed man of the dust of the ground, and breathed into his nostrils the breath of life; and man became a living soul.

"And Yahveh Elôhîm planted a garden eastward in Eden; and there he put the man whom he had formed.

"And out of the ground made Yahveh Elôhîm to grow every tree that is pleasant to the sight, and good for food; the tree of life also in the midst of the garden, and the tree of the knowledge of good and evil. And a river went out of Eden to water the garden; and from thence it was parted and became four heads.

"And Yahveh Elôhîm said, It is not good that the man should be alone; I will make him an help answering to him.

"And out of the ground Yahveh Elôhîm formed every beast of the field and every fowl of the air . . . but for man there was not an help meet for him.

"And Yahveh Elôhîm caused a deep sleep to fall upon the man, and he slept; and he took one of his ribs, and closed up the flesh instead thereof, and the rib which Yahveh Elôhîm had taken from the man made he a woman, and brought her unto the man."

Such is the Hebrew form of the ancient Egyptian cosmogony. No one has yet attempted to reconcile *this* cosmogony with science. It has, of course, been reconciled over and over again with the later cosmogony set before it in Genesis, precisely as all other discrepancies have been reconciled, by the method which Bishop Butler contemptuously denounced. But with such reconciliations, purely theological in tone, we have nothing to do. They have no interest whatever for the scientific inquirer. As a mere matter of obvious fact, the two records are absolutely irreconcilable.

As M. Lenormant says: "No one has ever been able to explain how it is that man and animals are created by Yahveh in chapter ii. after having been created by Elohim in chapter i.; how it is that the name of Yahveh is said in Genesis iv. 26 to have been known to men ever since a period before the Deluge, when in Exodus vi. 3 it is said to have been unknown to the patriarchs; how it is that in Genesis vi. 5 it is Yahveh, and in verse 12 it is Elohim, who sees that the world is corrupt; and lastly, how it is that, while in Genesis vi. 13 Elohim orders Noah to make the ark, it is Yahveh in chapter vii. 1 who commands him to enter it; and how it is that in doing so Noah obeys Elohim according to verse 5, and Yahveh according to verse 9."

Of course all the peculiarities of the Book of Genesis, all the contradictions, and all those ideas which, in the presence of what is now known, appear crude and fantastic, are very easily understood when we recognise the diversity of the materials which Nehemiah and Ezra worked into the Pentateuch. Though previous high priests and scribes had manifestly been unwilling to regard as sacred all the documents which had been collected and were under their charge,

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Nehemiah seems to have been unwilling to discard any of these documents absolutely. Antiquity doubtless gave them a sacred character in his eyes, which had been wanting when Hilkiah, for example, two centuries before, had gone through the collection. Hilkiah must have examined and rejected many of the documents which Nehemiah and Ezra accepted as sacred. But besides the old documents relating to early Jewish history and to Egyptian thought, Nehemiah had access to other materials of great antiquity unknown to Hilkiah. Among these may be included Babylonian records of various sorts, in which he seems so far to have placed trust that he thought it necessary to work them into the record of the earliest ages to which his collection of documents referred. So can we understand not only the diverse cosmogonies, but also the diverse accounts of the Flood in the early chapters of Genesis.

More perplexing perhaps are the contradictions, and especially the repetitions with changed names, in the accounts of patriarchal times. The story of a patriarch travelling with his wife and calling her, for his own safety's sake, his sister, must have been especially a favourite in the folk-lore of pre-Mosaic Semites; for not only is it told twice of Abraham and Sarah, with alterations of detail, but it is related also of Isaac and Rebecca, or of Yiçe'hâq and Ribqah, as our old friends appear in the newer translations.

A good feature in the volume before us is the separate appearance of the Elohistic and Jehovistic passages, as well as the usual form of the Book of Genesis with these accounts and others mixed up together. The quotations from the Targums of Onkelos, Jonathan ben Uzziel, and others, are also full of interest. The Targum of Onkelos is held to be of equal authority with the Mosaic text; and although some of the passages in it may appear, on account of their novelty, more surprising than those in the Book of Genesis as read in our churches, they could be quite as readily "reconciled" either with modern science or with other versions.

The introduction by the author of "Mankind, their Origin and Destiny," contains much interesting matter, not altogether well arranged—in fact, we fail to recognise any arrangement at all. The following extracts serve to show the view taken of the Jewish race, and of their fitness to teach the world religion. It is not altogether the view maintained by Mr. Matthew Arnold in "Literature and Dogma":—

"The Jewish conception of the Universe is that it was created expressly for them. . . . The seed of Abraham, 'the chosen ones' (Ps. cv. 6), were under the special care of Jahveh. 'As for the other people which also come of Adam, Thou hast said that they are nothing, but be like unto spittle' (cheerful for *nous autres*), 'and hast likened the abundance of them unto a drop that falleth from a vessel' (2 Esd. vi. 56). 'Anthropology,' says M. Burnouf, 'places the Semites between the Aryans and the yellow races. . . . While eminently superior to the yellow races, they manifest as regards ourselves differences which do not admit of their being classed with the Indo-European race. The true Semite has flat hair, in consequence of which the hair of his head presents a crisped appearance; his nose is extremely hooked, his lips are projecting and fleshy, his extremities are large, his calf small, and he is flat-footed. What is of more consequence is that he belongs to the occipital races—that is, to those races in which the posterior part of the head is more developed than the anterior or frontal portion. His growth is very rapid. At fifteen or sixteen years of age it has ceased. At the latter age the anterior portions of his skull, which contain the organs of intellect, are firmly brought together, and frequently even cemented to one another. The result is that there can be no further development of the brain, and especially none of the grey matter.' The Semites are unknown to history till a period between 3000 and 2000 B.C., when they gradually conquered the primitive and highly civilised populations of Babylonia."

It is strange to think how this people has conquered the average intellect of the Indo-European races—how widely they have caused to prevail their innate idea that "the universe was created expressly" for the Jews. Yet there is promise of freedom; the dawn of a clearer and purer day seems to have begun.

EVOLUTION OF LANGUAGE.

By Ada S. Ballin.

IV.—LOSSES AND GAINS IN LANGUAGE.

I SPOKE in my last of the various changes which the meanings of words may undergo in the course of time, and showed how the original meanings very frequently became obscured or forgotten. When the real meanings of words are unknown, and no reliable data are attainable as to their origin, the most plausible meanings that can be found are tacked on to them on the most flimsy pretexts. Prof. Sayce* has given an amusing instance of this. An old housekeeper, in a large mansion in the north of England, was in the habit of pointing out a Canaletto to visitors, with the remark that it was "a candle-light picture, so called because it could not be seen to best advantage during the day." Of like character may be the origin of many erroneous derivations as well as myths, and this tendency to make a meaning where none can be found has played its part in the development of language. For example, *pramanthus*, the name of the fire-machine anciently used in India, where two sticks were rubbed together, gave rise to the Greek myth of Prometheus, who stole fire from the gods. The Greek goddess Athênê takes her name from the Sanscrit *Ahanâ*, the dawn, of which a Vedic hymn says:—"Ahanâ comes near to every house, she who makes every day to be known." So that the origin of the Greek myth of the birth of Athênê from the head of Zeus is simply that the dawn springs from the face of the sky. Similarly Kronos, time, is said to devour his own children, the days and hours; similarly, also, the constellation which we know as the Bear got this name through a confusion in the Greek mind between *arktos*, from a root meaning to shine, and another *arktos*, from a root meaning to destroy, which signified *bear*. Hence the myth of Kalisto, who was changed by Zeus first into a *bear* and then into the star of that name. To return to modern times, Mount Pilatus, in Switzerland, the name of which literally means *cloud-capped*, has caused the Swiss to invent a story connecting it with the death of Pontius Pilate; and, to come from the sublime to the ridiculous, I may inform my readers that the *Colorado* is the *coloured* beetle, and has nothing to do with the place Colorado, whence it does not come. Ordinary persons would say that a walnut-tree was a tree so called because it is trained against a wall. Yet the word *wall* in this name has nothing to do with bricks and mortar, but simply means *foreign*: Danish, walnoot; Saxon, *walh*=foreign; German, wälsche nuss (Welsh nut), that is, foreign or Celtic nut. An itinerant vendor of vegetables, if asked why asparagus was so called, would probably say: "Sparrergrass is sparrergrass cos the sparrers eat that kind o' grass." In old cookery-books, and in some counties, "grass" or "gress" is the market-gardener's name for

* "Introduction to the Science of Language," Vol. I. p. 244.

asparagus. The old English word was *sperage*, probably from the Greek *speira*, a spire, owing to its long, narrow form. About 1600, the classical form asparagus was brought into use, and within fifty years after that time the word had been corrupted to *sparagrass* and *sparrowgrass*, which form prevailed so far that Walker, in 1791, remarked: "*Sparrow-grass* is so general that *asparagus* has an air of stiffness and pedantry."

Not only, however, may words, as I have shown, change so much both in form and in meaning as to be unrecognisable except to the trained eye or ear, but they may also drop out of use altogether, or be retained only in special senses, as, for example, many are existent in jurisprudence which were once words in general use. Thus, to take a few examples at random: *Forthright* was used by Sidney to mean "in a straight direction;" *forthy* (Saxon *forthi*), meaning *therefore*, by Spenser; to *bemete* with Shakespeare meant to measure; *cest* (Latin *cestus*) was used by Collins for a lady's girdle; *mure* (French *murer*) to enclose in walls, wall up, is now only known in the form of the verb to immure; the word *pelt*, skin of a beast (German *pelz*, Spanish *pelada*, Latin *pellis*, used also in the form *fell*, as *wool-fell*, &c.), is known only to those engaged in the fur or leather trades. Words fall into disuse through the loss of the ideas they express: as, for example, numbers of words in use in chivalry, which, if they survive at all, do so only in the old-world science of heraldry; words common in the feudal state, now no longer required; or those employed in now-exploded theories of science. Words are also supplanted by others expressing the same ideas but of different origin. This latter cause of change in language is mainly brought about by intercourse of different peoples. Where nations, or even small communities, live shut out from the rest of the world, their languages or dialects remain unchanged proportionately to the degree of their isolation. Among the French-Canadians words are now in use which are quite obsolete in France; and the same phenomenon is observed in the English of New Englanders, for, writing about forty years ago, Mr. James Russell Lowell remarked that the dialect of Massachusetts contained many words "noted in English vocabularies as archaic, the greater part of which were in common use about the time of King James' translation of the Bible." "Shakespeare," he said, "stands less in need of a glossary to most New Englanders than to many a native of the old country." Those cut off from immediate intercourse with the Mother-country are of necessity unacquainted with the changes which have taken place in the mother-tongue, and although their own language will not have remained stationary, its changes will have been peculiar to itself.

Besides the loss of whole words, grammatical forms and distinctions tend to become obsolete. Thus English has lost the case-endings possessed by its ancestors, and the same is true of the personal endings of verbs. A similar tendency to do away with forms which are redundant or not absolutely necessary for the expression of thought exists in a more or less degree in all languages. The Semitic noun originally possessed three cases—nominative, genitive, and accusative, but these gradually died off in some of its branches, as in Hebrew,* and symptoms of the similar decay of case-endings are very apparent in modern Arabic, as compared with the literary language. The reason for this decay is obvious. Language is an instrument for the expression of thought, and, in order to be perfectly adapted to its use, it should express the thought in the clearest and briefest way possible, and its parts should tend to uniformity of structure. Hence case-endings and other grammatical forms are dropped, the context being usually sufficient to indicate the relations of the various words in a sentence, or their place is taken by particles, such as *to*, *for*, *with*, *by*, &c., which are applicable in all instances without further change. Finnish has fifteen cases, and Hungarian more than twenty, but this does not constitute them the better instruments for expressing thought. The complications of case-endings, such as are seen to the full in German, are not only unnecessary but cumbrous to the memory, and may, in fact, be regarded as barbarous. There is little doubt that they will eventually disappear, but probably not in our time. I have briefly referred to the losses of words and grammatical forms, but, although it may seem paradoxical to say so, these losses are in reality gains. They are a part of the natural development of language, which tends to integration, unity, and simplicity.

The introduction of new words and forms into language is always going on, and their origin is sometimes purely accidental. A good example of the accidental origin of a word is that of *schooner*. The first vessel of this sort was built at Massachusetts, and, when launched, a bystander, admiring her graceful movement, exclaimed, "Oh, how she scoons." "A *scooner* let her be, then," said the builder, and coined a new English word.

The word *furbelow*, now commonly used to express a fussy arrangement of ladies' drapery, is one which was originally spontaneously coined out of relation to other words. It is first found in De Caillères, and, according to Nodier, was invented by Marshal de Langlée, who, passing a milliner's shop, determined to puzzle the assistant, and, entering, asked for a *falbala*. The fitness of the word was, however, instantly acknowledged, and the girl brought him the dress which was at that time called *volant*, because of its light, floating points. Other such words are *od* or *odic* force, invented by Reichenbach, and *sepal*, invented by Necker to express a division of the calyx of flowers. Pierre Rivière, the murderer, invented the words *ennepharer*, to express a certain form of torture to which when a boy he used to subject frogs, and *calibène* for the instrument he employed to kill birds. These words have not survived, and their unfitness is very apparent. A curious word, which seems to me unconnected with any other, is largely used in my own family, both in the form of verb and noun. The word is *thoke*, in the sense of to lie in bed late in the morning. One of us will commonly say to the others, "I'm going to thoke to-morrow morning," as an indication that early breakfast is not required, or, "I had a good thoke this morning," meaning "I got up late for a treat." The word is a very useful one, as it embodies an idea which would otherwise have to be expressed in a number of different words—the idea of staying in bed late for a treat. It was introduced into the family about ten years ago, from a book which I believe was called "The Winchester Boys," and in which it is used in the same sense in which we employ it; but I am unable to say whether it originated with the author of that book. To indicate how dialectic variations may arise, I may add that my brothers-in-law pronounce the word *thoke*, which they have picked up from their wives, as *soak*, and maintain that this is correct, by a false derivation connecting it with the verb "to soak," meaning "to immerse."

With regard to the origin of most new words, it may be said that an idea is present in the mind which desires to communicate it, and certain materials already in existence are generally seized upon and combined to serve the purpose of communication. The word *gas*, connected with *geist*, *ghost*, and *yeast*, was invented by Van Helmont, the great chemist, about 1600 A.D., to express a chemical discovery of

* See "A Hebrew Grammar with Exercises," by Ada S. and F. L. Ballin, page 22 (Kegan Paul, Trench, & Co.).

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his own. Two or more familiar syllables or words may be united for the same purpose, as *railway*; or old words may be newly applied, as *revolver*, a pistol that has a revolving part. A word thus originated in the mind of the individual, its survival depends upon its utility and fitness, and, once generally adopted, it may ultimately become the parent of many others, and its range of meaning may be indefinitely widened. Whitney says that if every meaning attached to a word were to count as a separate word, the hundred thousand words of which the English language is formed would doubtless be increased to a million or two; while the Rev. T. Hurlbut has made the stupendous calculation that seventeen million verbal forms may be made from one Algonquin root.

In the complicated languages of civilisation, however, it is doubtful whether any one individual ever acquires the whole language—that is to say, knows every word of it. Each adopts that part of it which suits his own purpose. The English language consists of about ninety or a hundred thousand words. Out of these Shakespeare uses about 15,000; Milton, 8,000; a person of ordinary culture, 3,000 or 4,000; and an agricultural labourer possibly not more than 300; while a journalist accustomed to deal with many subjects would probably reach 13,000 or 14,000.

Charles Reade describes the daughter of a small shopkeeper in Liverpool as having "plenty of tongue and mother-wit, but she could not, and would not, study anything if it had the misfortune to be written or printed."* Further on,† he says, "Her whole vocabulary was about nine hundred words, whereas you and I know ten thousand and more; yet she would ring a triple bob-major on that small vocabulary, and talk learned us to a standstill." Volubility does not necessarily imply a large command of words; while, on the other hand, we have all heard of the great man who was silent in fourteen languages.

Each language meets the average necessities of its speakers. A small mind can only grasp a small part of it; but a large mind will often find it too small for its requirements, and will have to seek among other tongues the means of expressing its thoughts. An African above the level of his race would be fettered by the language to which he was born; but English would open up a wide range of ideas to him, and raise him infinitely higher than he could rise without some such means of marking and signifying his thoughts. A language expands and contracts in adaptation to the needs and circumstances of those who use it, and it is enriched or impoverished with the minds of its speakers. Conversely, an Englishman forced to express his ideas in some African dialect would be wholly at a loss, for where the ideas have never been the words cannot be found. Similarly, every language possesses some words, phrases, or, as they are called, idioms, which cannot be exactly translated into another tongue; every nation has some peculiar modes of thought, and thus it is that the intellect is widened by the acquisition of foreign tongues.

Words are learnt by children much on the same principle as they are adopted by communities. Among the hundreds of words that a child hears every day, it picks up, as we may say, those which apply to its own few and limited ideas, leaving all others. Of course imitation plays a large part in the acquirement of speech by children; but if by imitation a word is taught to a child which it cannot apply to any thought, it is soon forgotten and not really adopted into the little one's language. As new ideas are taken into the mind or grow up in it, new words and combinations of words are adopted to express them. In the race new ideas are acquired but slowly, and the means of expressing them are, therefore, but of tardy growth; but the child is constantly under the tuition of older individuals who have acquired a great part of the sum of thought and language developed in the race, and thus it is that each child acquires in the course of a few years the total results of a culture which its ancestors have taken countless centuries of development to gain. This acquisition is limited only by the individual capacities of the child; but if these capacities are great he may himself leave behind him some idea and some word which shall find a place in the culture of his race. Thus it is that the processes of civilisation, and among them language, are evolved. To each child, with words, are taught also distinctions, classifications, abstractions, and relations; while by their means attention is directed to matters which call for observation, the senses are roused into fuller consciousness of perception, and the reasoning powers are trained.

The position has been clearly defined by Whitney, who says, "Language enables each generation to lay up securely, and to hand over to its successors, its own collected wisdom, its stores of experience, deduction, and invention, so that each starts from the point which its predecessor had reached, and every individual commences his career heir to the gathered wealth of an immeasurable past."

* "Singleheart and Doubleface," p. 1. † Id. p. 2.

MIND ACTING ON BODY.

By Richard A. Proctor.

BUT, striking as are the cases thus far considered, which relate to disorders of a kind which have been known in many cases to yield to the action of the imagination, the reader may be more struck probably by cases in which the actual progress of internal organic diseases would seem to have been arrested by psychical means. Some thirty years ago Sir John Forbes mentioned some remarkable instances of this kind, which had been described in a very interesting paper communicated to the *British and Foreign Naval Review* by a naval surgeon whose high character was well known to him. Most of these cases are not such as could be advantageously described in full in these pages. The following account, one of the most striking, has been abridged and verbally modified (not at all altered in essentials) to render it more suitable for my readers. In July 1845 the company of a Government ship were attacked by an epidemic complaint, which in several instances led to a severe form of dysentery. Among those who suffered most was a first-class petty officer, who, though he had had but a mild attack of dysentery, had been much distressed by some of the sequels of the disorder. To remove these, very powerful medicines had been employed, and successfully, save in this respect—that intense irritation of the stomach had been produced, from which the patient suffered severely. External irritants were employed until the poor fellow's skin became perfectly callous; sedatives were given until his senses were muddled; but he seemed to obtain not the least relief. "This being so," says the writer, "I determined to try the effect of mental influence: stating to him, as I did to the other men, that as his disease was most obstinate, so was it necessary to have recourse to desperate means to relieve it; that with his sanction I would therefore put him under a medicine which it was necessary to watch with the greatest attention lest its effects should prove most prejudicial, perhaps fatal, and so forth. Having by these statements

made an impression, it became necessary to keep it up. This was done by repeated visits, at all hours of the day and night, and by expressing on these occasions the most intense anxiety as to the effect of the very powerful and dangerous medicaments. This was not a case in which a sudden effect could be expected to be produced, whatever might be the means employed. Symptoms of disease existed which bore too close a resemblance to those of an organic order to admit of hope of a sudden, if even of tardy, relief." (It will be seen presently that unmistakable evidence was afterwards obtained of the existence of such organic mischief as the surgeon at this time feared.) "Hence the pills (*bread*, of course) were given every sixth hour only. Within twenty-four hours the man's sufferings were decidedly less. Within four days he was almost free from pain. On the sixth day he was quite so; his pills were omitted; and at the end of a fortnight he was again at duty with a clear eye, a healthy skin, and was rapidly regaining his flesh. Here, as in most cases where this method has been tried, the diet and drink have been left unrestricted. Occasionally, however, it became necessary to taboo some article, lest its coming in contact with the remedy might prove most destructive; in other words, articles were occasionally forbidden when the mind seemed to be inclined to lose sight of what must be made the all-important subject of thought by night and day. The wonderful improvement in this man's state was frequently commented on by both officers and men, who of course were, and still are, as little acquainted with the means employed as the patient himself was."

This case is so remarkable that we might well be disposed to consider that the man's cure was not in reality affected by the means to which the surgeon attributed it. Might not the illness, for instance, have been on the point of yielding to the remedies used before the mental method was tried? Or may there not have been some other cause at work? for to mention no other, a patient on board ship may have changes of climate unlike those ordinarily experienced by the patient on land. One feels disposed at a first view of the case to prefer an explanation based on the possibility of some such causes as these having acted, than one which in reality requires us to believe that a man (and one too, be it remembered, not specially trained, like some Eastern devotees, to fix his attention constantly on his interior), by thinking constantly about the good effects of a supposed medicine upon his stomach and intestines, could actually cause organic changes to take place in these viscera. The case would then be a singular introversion of the state of things described by Macbeth. He says, "Canst thou not minister to a mind diseased?" But here the physician throws his physic on one side, not because he cannot minister to a mind diseased, but because he believes a healthy mind has the power of ministering to a diseased body when physic has altogether failed. The memory (of bread pills and of their imagined potency) was here trusted to pluck from the intestines a rooted trouble, the brain was called upon to raze out the written troubles of the stomach. For it appeared afterwards that these troubles *were* written (at least, in the poetic sense in which Shakespeare uses the word). They had, at any rate, made their mark. Let the rest of the story be carefully noted. "It may be said," proceeds the narrator, "that this case, as above given, goes for nothing, in so far as it does not show that the pains were anything but casual; in which case any mode of treatment, or very likely no mode at all" (doubtless the reader has already thought of the possibility that the medicines made most of the mischief), "would have been equally successful; or it may be again, as it has before been said, that it" (the disease presumably) "was altogether feigned, and that the commanding officer would have made a better and quicker cure. I think not; and for the following reasons: the man's flesh had wasted; his eye became sunken; his skin sickly in hue, as well as in feeling; his sleep, when he had any, was of the most disturbed character. But more than all, the pain after some weeks returned, and the other bad symptoms followed in its wake; *yet both it and they were relieved a second time by the same means.* While suffering from a third attack he was sent to the Royal Naval Hospital at Malta, and there, after much suffering, he brought up by vomiting a portion of the mucous membrane of one of the small intestines" . . . clearly recognisable by a well-trained medical eye. "I am distinctly assured," says our author, "by one of the officers of the establishment, that he most carefully examined the ejected matter, and that its characters were so marked that there could be no room for a doubt as to what it was. This being so, we have pretty clear proof that disease existed long before this slough was thrown off; and that even this organic disease was suspended, on two occasions, by mental influence only."

The question how far it is a legitimate medical practice to deceive a patient in such a case as the above has been raised by Dr. Todd, and is answered by him in a way which seems open to objection. "Nothing," he says, "can justify our asserting what is not true in order to gain the patient's confidence." And elsewhere, "in regard to misleading patients generally, even *causâ scientiæ*, one of the practical difficulties the investigation into the influence of the imagination presents is certainly the unseemliness of making experiments of this nature, and the danger of sullying that strict honour which by no profession is more prized or maintained than by the professors of the medical art." If the cause were that of science alone, this emphatic opposition to the misleading of a patient might be regarded as justified. But there certainly seems an excess of strictness in objecting to the deception of a patient for his own good. If a doctor is perfectly satisfied that a patient will not recover without a strong mental effort, and that this effort will certainly not be made unless the patient is misled with regard to the nature of the treatment, the doctor might fairly consider it his duty to "assert what is not true to gain the patient's confidence." An adherence to veracity so scrupulous as to outweigh the life of a fellow-creature may appear deserving of admiration when dealt with in a treatise on morals, but in actual life would be altogether objectionable. If it be urged that liberty to deviate in some such cases from strict truth might be open to abuse, it may at once be answered that so also would liberty to select the strictly veracious course (under any circumstances) be open to abuse. Consider, for instance, the following case, which is by no means an imaginary one. A man is lying prostrate under a very dangerous illness, and it is known to all who attend on him that any severe mental shock must inevitably prove fatal to him, but that if for a few days he can be kept free from mental disturbance he will recover. He sends a messenger to inquire about the health of a beloved relative, whom he knows to be in a critical condition, or exposed perhaps to some special form of danger distinct from illness. The messenger, when he reaches that relative's house, is informed that death has been there before him. Shall he return and tell the patient the truth, thereby certainly killing him? Let it be assumed that he must at any rate take some message back; protracted anxiety being, let us suppose, as dangerous for the patient as the sudden shock of illness. He can do only one of two things: tell the truth and kill, or assert what is not true and spare the patient's life. Few will question what he ought to do. But the question may be raised, is he to be regarded even as free to choose? He holds for the time being the patient's life in his hands; he

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can kill or spare; if he kills, how should he escape reprobation? And might he not be so situated that liberty to choose one or other course might be abused if he told the truth? His fatal veracity might not be the offspring of a tender conscience, but of greed or some other evil passion. The doctor in the cases considered by Todd is somewhat similarly circumstanced. He is satisfied that there is a chance, at any rate, of saving life, if his patient is assured that certain substances are medicines potent to cure. Is he justified in refusing to his patient this chance of life? Doctors might unquestionably use for a wrong purpose the right of misleading a patient for his good; but they might use for a worse purpose the right (if they possessed it) of killing him with the blunt truth.

A singular case, bearing in some degree on the right to mislead a patient, was described a few months ago in a public address by a well-known American doctor. A young lady in one of the Western States was convinced that a bristle of her tooth-brush had become imbedded in her throat, and was causing mischief there, which would terminate fatally if the foreign body were not removed. The family doctor, and after him several physicians of repute, examined her throat, and all agreed in assuring her (which really was the case) that there was no bristle there at all. She continued to grow worse, the imaginary bristle causing all the effects which a real bristle might perhaps have caused—at any rate, all the effects which she imagined that a real bristle would cause. At last a young surgeon was consulted, who followed a different line of treatment. Looking long and carefully at her throat, and examining the afflicted part with several instruments, he at last gravely assured her that she was quite right; a bristle was there, and the inflammation she experienced was undoubtedly due to it. He could not, he said, remove the bristle at once, as the only instrument which would effectually reach it was at home. He went home for it, as he said, but really to inclose in an instrument of suitable form a bristle from a tooth-brush. Returning, he carefully nipped the skin of the throat where the young lady felt the pricking of the non-existent bristle, and, after causing her enough discomfort to satisfy her that this time the operation of extracting the bristle was certainly in progress, he withdrew the instrument in triumph, and along with it the bristle, which had indeed first entered her mouth in that instrument's company. From that time she recovered rapidly. For it will be understood that, though there was no real cause for her fears, a real irritation had been excited by them, and organic mischief had resulted. The story ends here so far as our present subject is concerned, though as a tale it may seem to many incomplete without a few words more. The young surgeon, we are told, was highly in favour thenceforth. He had not only saved her life, as she supposed, but had shown her to have been right, and all her friends, as well as the other doctors, wrong. She would have accepted his hand but for the circumstance that, having already a wife, he omitted to offer it. She blazoned abroad his fame, however, until he had become famous "throughout the whole State." All would have ended pleasantly had he not in a moment of weakness confided the true explanation of the young lady's cure to his wife—of course, under promise of strict secresy—which, however, did not prevent the story from reaching the young lady's ears in a few hours. It is hardly necessary to say that thenceforth her feelings towards the doctor were the reverse of those she had entertained before. True, she owed her cure to him, but the cure was worse than the illness.

In the case last considered, which, be it remembered, actually occurred, though probably some of the surroundings were a little altered by the narrator, the truth, supported though it was by the weight of authority, not of one doctor only, but of several, was found ineffective to arouse the will of the patient even against a disease which had had its origin in her imagination only. We may well doubt then whether, if the influence of the mind on bodily processes were thoroughly recognised and admitted, it will be found possible to produce the same effect by a direct and truthful appeal to the will as by misleading the patient. That some few persons of strong will could by a resolute effort check the progress of actual disease in their internal organs, or excite processes of organic change resulting in cure, may be admitted,* but it must at the same time be admitted that in the large majority of cases this would not happen, even if the patient could be persuaded to make the attempt. It is only when unconscious of control that the ordinary mind is capable of directing the attention fixedly in the way required. And of course, in the great majority of cases, the doctor has to deal with men of ordinary mind, not with those possessing strong power of fixing the attention, and resolute will to exert that power.

(To be continued.)

INTRODUCTORY STUDIES IN GREEK ART.†

MISS HARRISON'S new book is one which may be read with interest by many classes of readers. It is a useful addition to the library of the art student, and it throws a light on art matters which the general reader will be glad to find. The authoress is no superficial dabbler, nor does she lose herself in dry technicalities, but she endeavours to explore the causes and motives of artistic developments, and to grasp the spirit while not neglecting the letter. Thus she shows the influence exercised on the Greeks by the art of Egypt, Assyria, and Phœnicia, and deals with the early artists in a masterly fashion. She points out how the apparent monotony and conventionality of Egyptian art mainly arose from the conservative character of the people, as influenced by the physical peculiarities of their country, by the despotism of their kings, who, in the longing for immortality and the love of self-glorification, commanded the vast size of their monuments, and by the hard material employed for the sake of durability by a preference characteristic of the Egyptians, who preserved their mummies in the belief that the soul would in some far distant time return to its disused body. The want of ideality in Egyptian statues may be traced to the fact that they were not primarily intended as *objets d'art*, but were actual representations of the individual rendered as lifelike as possible, so that, if when the soul returned it should find its mummy in an imperfect condition, it should take up its abode in the statue, and to this end they were buried with the mummy to lie hidden from the world until discovered by the pick

* I offer the following experience with some diffidence, because the effects supposed to have resulted from an effort of the mind may be otherwise explained—possibly were due to mere coincidence. Still, such effects have been noticed in so many cases, that I am disposed to explain them in the way suggested. It has frequently happened to me that during a busy week, fortnight, or month of lecturing I have noticed signs of an incipient cold—such signs as under ordinary conditions have been nearly always followed by a severe cold with loss of voice. Now I have observed that in the majority of instances of this kind no such sequel has followed, although no greater care has been taken to check the progress of the cold than at other times. It is as though the strong feeling that I *must* not take cold prevented me from doing so.

† "Introductory Studies in Greek Art." By J. E. Harrison. T. Fisher Unwin, London. 1885.

of the workman or explorer. By Egyptian belief the dead man became a part of the god Osiris, and thus by a natural transition the funeral chapel became the temple. In this may be found the explanation of the fact that, while temples dedicated to a god alone are found on the east bank of the Nile, on the west, where funeral chapels would naturally be built near the City of the Dead, these exist in temple form in honour of a king and god conjointly. Such is the temple of Seti at Abydos in honour of six gods and of Seti himself. On Egyptian, as well as Assyrian and Phœnician art, picture-writing had a very great influence. In the hidden recesses of the Egyptian tomb are painted and sculptured the history of the dead man's deeds in life, the story of the soul's wanderings and transformations after death. On bas-reliefs, on the stone copies of the robes of Assyrian monarchs, on Phœnician bowls are sculptured the adventures of kings, the myths of the gods, and metaphorical representations of the nation's power and history. The Phœnician colonies spread over the Mediterranean Sea, and the treasures of Eastern art brought by these enterprising traders aroused the rude artists of Greece to rivalry. The metope of Selinus' temple, now in the Palermo Museum, the subject of which is the slaying of Medusa by Perseus, is a specimen of the childhood of Greek art. It shows traces of colouring, and the clear influence of the East. (See fig. 6, p. 157.) With the Greeks, however, the human form was looked upon as the perfection of beauty. Among their predecessors the form was nothing, attention being given only to the face and the drapery. The first Greek gods were heroes, and just as the gods were idealised men, endowed with human emotions, so they were represented in human form with the bodies of men and women rendered as perfect as study and the selection of the most perfect models could make them. Miss Harrison sketches the progress and decay of art in Greece, from its rise to its fall, under the influence of Rome; but in this branch of her work space forbids our following her. Her book is not only instructive, but very pleasant reading, since her style is easy, forcible, and entirely devoid of pedantry. The book is beautifully illustrated with photographs reproduced by the Meisenbach process, which greatly enhance its value.

THE SIDEREAL SYSTEM FATHOMLESS.*

By RICHARD A. PROCTOR.

IT is commonly supposed that Sir W. Herschel's plan of star-gauging demonstrated that the sidereal system has limits to which his gauging telescopes penetrated (save in a few directions), and that even where the system has its widest extent its limits are certainly attainable by such telescopes as men may well hope to construct. I would invite attention to certain evidence pointing to a very different conclusion.

It is perfectly clear that if the sidereal system have the figure hypothetically assigned to it by Sir W. Herschel, that of a lens shaped stratum throughout which stars are distributed with tolerable uniformity, then we must accept the evidence adduced by him as sufficient to prove that we can attain to the limits of this stratum. To use the words of Professor Nichol: "When an eye is directed towards a prolonged bed of stars, there is no reason to fancy that it has reached the termination of that stratum, so long as there appears behind the luminaries, which are individually seen, any milky or nebulous light, such light probably arising always from the blended rays of remoter masses. But if, after struggling long with a nebulous ground, we obtain a telescope that gives us additional light with *a perfectly black sky*, we then have every reason the circumstances can furnish on behalf of the supposition that at length we have pierced through the stratum—a probability, indeed, which can be converted into certainty in only one way, viz., when no increase of orbs follows the application of a still larger instrument." Sir John Herschel also says that in those regions where the zone is clearly resolved into stars well separated and seen projected on a black ground, it is *certain* if the ordinarily accepted theory be correct, that we look out beyond into space.

But this conclusion would no longer follow as a necessary consequence of such observations if, instead of regarding the sidereal system as of the figure and structure suggested by Sir W. Herschel, we supposed it to consist of clustering aggregations (including *streams* under that expression) of stars of every variety of magnitude. Then, in struggling with a nebulous ground, we should not be penetrating farther and farther into the celestial depths, but should be simply analysing more and more searchingly a definite aggregation of stars.

Let us consider a noteworthy instance, interesting not only because it illustrates the mistakes which might arise from falsely assuming a certain uniformity in stellar aggregation, but because it shows how a thoughtful astronomer like Sir W. Herschel would instinctively recognise, under such circumstances, the fact that he was going astray, and would be capable of quietly relinquishing views on which he had before laid considerable stress.

In the constellation Perseus there is a magnificent double cluster, visible to the naked eye on tolerably clear nights, and presenting, even in small telescopes, a scene which forces sensations of awe and reverence upon the least thoughtful mind. With a large telescope the spot "appears lighted up," says Nichol, "with unnumbered orbs, and these pass on and on, through the depths of the infinite, until even to that penetrating glance they escape all scrutiny, withdrawing into regions unvisited by its power. But shall we adventure into these deeper retirements? Then assume an instrument of higher efficacy, and lo! the change is only repeated; the nearer stars now shine more brilliantly; those scarce observed before appear as large orbs; and behind, a new series begins, again shading gradually away, leading towards further mysteries! The illustrious Herschel penetrated, on one occasion, into this spot, until he found himself among depths whose light could not have reached him in much less than four thousand years. No marvel that he withdrew from the pursuit, conceiving that such abysses must be endless!"

But this conclusion, that the light from the furthermost parts of the cluster occupy some forty centuries in reaching us, while the light from the larger stars in the cluster, according to the usual estimate of star magnitudes, would occupy but one or two centuries, brought with it perplexities which Sir W. Herschel was too clear-sighted not to recognise. It required that the real shape of the cluster should be somewhat as is shown in the accompanying figure, in which S is the sun, and S B is some twenty times as great as S A. On no other supposition could the peculiarities of the cluster be explained, so long as it was understood that a general uniformity of magnitude and distribution prevails among the component stars.

Sir W. Herschel was thus led to recognise the cluster as including within its bounds stars varying greatly in real magnitude. Nay, he pronounced the opinion that we have in this cluster a sort of nodule of the Milky Way—a dis-

* This paper, like that on the Figure of the Milky Way, was written when I was in correspondence with Sir John Herschel about the architecture of the Heavens.

tinct clustering aggregation of stars within the limits of the galaxy.

Now let us consider what such a change of view meant. Instead of supposing that each increase of telescopic power had enabled the observer to pierce farther and farther into the sidereal depths in this direction, Sir W. Herschel now saw that all the successive investigations had dealt with the same region of space. The difference was as great as though an astronomer, discovering new asteroids and conceiving their minuteness to be due to distance, so that they all lay hundreds of times farther off than Jupiter, suddenly learned their true nature and that all his researches had dealt with a zone far within the orbit of the giant planet.

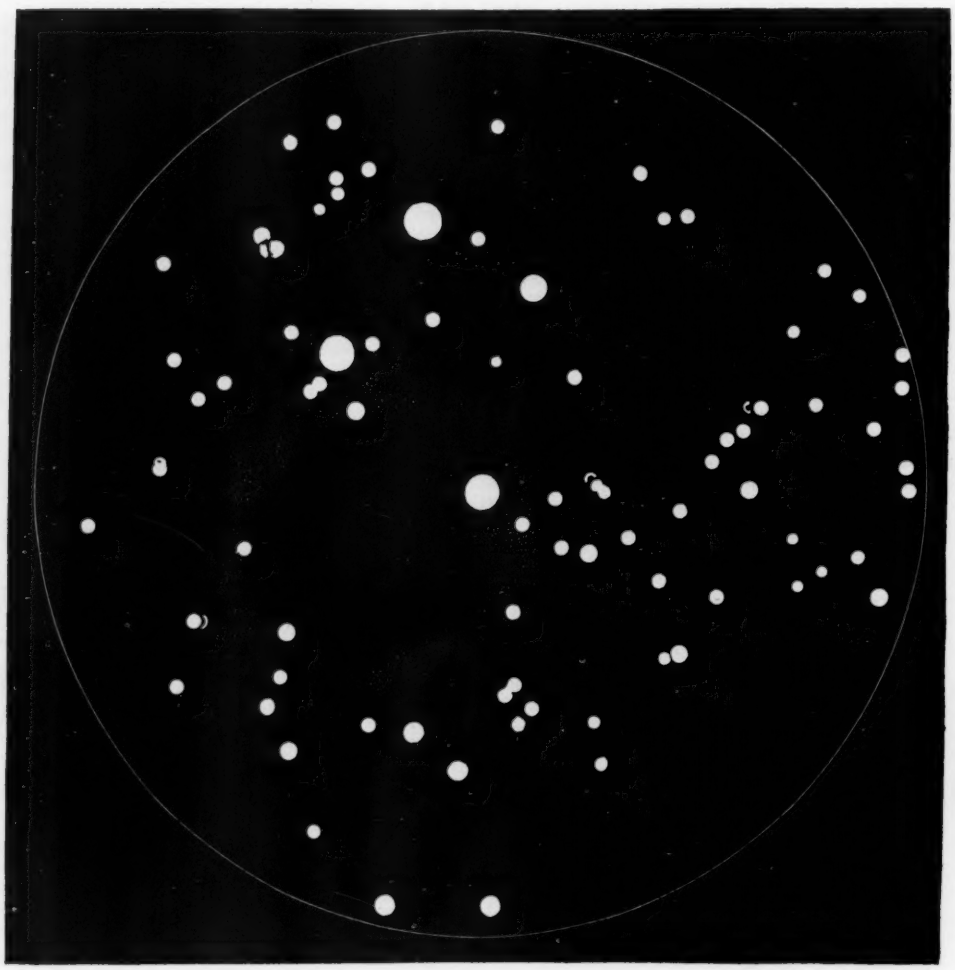
Are we quite sure that a similar error does not affect the whole system of star-gauging, or rather the fundamental principle on which that system is established? What real evidence have we that, when we are poring more and more searchingly into the recesses of the great star-girdle, we are passing ever to distances farther and farther from the sphere of the lucid stars?

It seems to me that, before accepting the results which have been supposed to flow from the star-gaugings, we are bound to inquire somewhat more closely than has yet been done into the question whether the probabilities are in favour of that general uniformity of distribution and magnitude on which the plan was based.

Fig. 1.

Frustum of a Cone, enveloping the Great Cluster.

Fig. 2.



The Coalsack in Crux.

And here an important point presents itself to our consideration. *Admitting* this fundamental hypothesis, it is very obvious that we must pay no attention to the signs of special laws of association among the lucid stars. These stars are altogether dissociated from each other in reality, however they may seem associated—if only that hypothesis is correct. But when we are inquiring *whether* that hypothesis is correct, these signs of association are all-important for our guidance. We are bound to inquire whether they *can* be accidental. And so we are no longer free to smooth the star-groupings away by taking averages.

This bears in a very important manner on the problem presented by the Milky Way. Sir John Herschel, following very accurately the law of star-gauging, compares the total number of lucid stars on the galactic zone with the total number on the rest of the sky, and finds no trace of any aggregation in the former region. Hence he concludes (very justly, when once the fundamental law is accepted) that there is no real association between the lucid and the telescopic stars on the galactic zone.*

But suppose that instead of considering the galactic zone, instead of spreading the galaxy over a belt which it does not really cover, we look at the galaxy itself. And suppose, further, that as a first process of examination we compare the number of lucid stars falling on the galaxy with the number falling on the dark rifts and coal-sacks in the Milky Way, and on the space which separates the two branches where the galaxy is double. Doing this, we find at once the most striking evidence that the lucid stars are closely associated with the telescopic galactic stars; for we find a marked disproportion between the number of stars on the dark regions and the area covered by these regions. In many places, especially in the southern heavens, we find the very shape of the Milky Way indicated by the stars which lie round the border of the dark regions, but withdraw themselves, so to speak, from those vast openings into space.

Take as an illustration the coal-sack in Crux. Is it an accident that over this large dark space, covering about 50 square degrees, there is not a single lucid star, while all round its borders lucid stars are strewn in plenty? The whole surface of the heavens exceeds the coal-sack some eight hundred times in extent; and as there are about 6,000 lucid stars, one might expect seven or eight such stars to be found in the coal-sack. But this is far from being all. The neighbourhood of the coal-sack is much richer in lucid stars than other regions in the heavens; so that it is just where stars should be most richly distributed that this vast black spot makes its appearance. The question whether the absence of stars from the coal-sack and their presence in great abundance in the Milky Way around that vicinity are to be regarded as a mere coincidence can scarcely be doubtful, I think, to anyone who studies thoughtfully the portion of the galaxy depicted in fig. 2. Nor, perhaps, is the way in which the sharply-defined semicircular cavity on the right is associated with a semicircular stream of stars less significant. No one who examines this region thoughtfully can doubt, I should imagine, that the lucid stars seen in it are mixed up with the telescopic stars forming the Milky Way here.

But if we admit that such evidence as this (and much more of the same kind might be adduced did space permit) should lead us to regard the Milky Way as forming a stream of really small stars, swayed into its present figure by the large ones in its neighbourhood, it might seem that, so far from showing that our sidereal system has no limits, we should have gone far to prove that its dimensions are much smaller than had been imagined.

It is true that, according to these views, the small stars in the Milky Way would be far nearer to us than has been commonly supposed. But on the other hand, it would follow with equal certainty that we could no longer imagine we had even in any one direction pierced to the limits of the sidereal system. If in searching into the depths of any part of the Milky Way we are, in truth, merely searching more and more closely within a definite group of stars, beyond that group there may lie at enormous distances other groups which no telescope we can construct may even render visible. It was only, indeed, whilst it was thought that the sidereal system is continuous throughout its limits that astronomers could hope to say where those limits lie. If, on the contrary, I am right in believing that the sidereal system consists of aggregations of every conceivable form, those aggregations may extend into space, millions on millions of times beyond the limits of the most powerful instruments man may ever be able to construct.

* In his "Outlines of Astronomy" he uses expressions which would seem to indicate that he had forgotten the facts very clearly established and described on pages 381 and 383 of his observations made at the Cape of Good Hope. Nor can one wonder at this when one considers the wonderful range and extent of the observations recorded in that most valuable treatise, second only (if second) in value to the series of papers by his father in the Philosophical Transactions of the Royal Society.

New Books to be Read (or avoided)—and Why.

Kalee's Shrine, by GRANT ALLEN. Mr. Grant Allen's new story is a vigorous example of the "scientific use of the imagination;" the license of fiction is nowhere restrained, but the accurate description which comes of insight into, and sympathy with, nature's least garish scenes, is not lacking. The tale opens weirdly enough in the scorching jungles of India, but is speedily transferred to a humdrum watering place of old-fashioned type on the breezy flats of East Anglia. The incidents are numerous and original enough, however, to make the dry bones of the old town live again; and we can promise our readers an honest shillingworth's excitement, not without safety-valve in the sequel. Mr. Allen has, in more than one of his delightful fugitive sketches, laid stress on the unsuspected beauty in mud, and in "Kalee's Shrine" that unstable compound is made the scene of an episode which, for inducing an "eerie" sensation in the reading, has not been excelled, if equalled, in any of the now famous series in which the story is published. We must not risk spoiling the reader's interest by telling it.

Handbook of Mosses. By JAMES E. BAGNALL, A.L.S (London: Swan Sonnenschein, Le Bas, & Lowrey. 1886.)—The country reader who wishes for an introduction to a living world of strange beauty and variety, as well as the incipient student of bryology, may buy Mr. Bagnall's well-written and equally well-illustrated little volume with the certainty of finding what he wants within its two covers. Its author describes the few and simple appliances needed for the collection and examination of these exquisite lowly forms of vegetation; describes their development, instructs us how, when, and where to find them; gives a classification of the British species extensively illustrated; furnishes directions for their cultivation; and winds up with a chapter on their preparation for the cabinet and herbarium. His work is well and honestly done throughout.

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Rudiments of Chemistry. By Temple Orme. (London: Swan Sonnenschein, Le Bas, & Lowrey. 1886.)—This little book consists in effect of the description of a series of easy and attractive experiments, by the aid of which the rudimentary principles of chemistry may be explained and illustrated with facility. It is absolutely elementary, all use of the atomic theory being eschewed, and the consequent familiar equations being wholly absent from its pages. A large proportion of the experiments described may well be performed by any intelligent boy himself, and, apart from its undoubted use and value as a school manual, we cannot help thinking that it would form a very welcome and amusing present to any such lad with the slightest taste for scientific pursuits.

Mind your Eyes! Advice to the short-sighted, by their fellow-sufferer, Francisque Sarcey. Translated by R. E. Dudgeon, M.D. (London: Baillière, Tindall, & Cox, 1886.)—To everyone suffering from short sight we would say, buy and read M. Sarcey's amusing brochure straightway. When we add, though, that it tells how he himself absolutely lost the sight of one eye, and had to submit to the operation for the removal of a cataract in the other, it may appear, to say the least, odd, that it can be possible to apply the term "amusing" to such a narration. Nevertheless we repeat it in connection with a piece of personal history, written with all the brilliancy of one of the most accomplished of French littérateurs, and also repeat our recommendation to all myopes to learn from its pages a lesson which may be of priceless value to them.

THE FACE OF THE SKY FOR MAY.

By F.R.A.S.

[In the preliminary note to this column, on p. 196, we recommended the reader of our notes to provide himself with "The Stars in their Seasons." We would further advise him to procure "The Seasons Pictured," also by the conductor of Knowledge, as he will find the zodiacal maps in it particularly useful in tracing the paths of the planets. The large scale on which they are drawn and the projection adopted render them very suitable for this purpose.]

THE sun should be observed on every clear day, as fine spots and groups still appear at intervals on his surface. Map V. of "The Stars in their Seasons" exhibits the aspect of the night sky. After the 22nd twilight will persist all night long throughout Great Britain. Mercury is a morning star throughout the month. He attains his greatest elongation (26° 16′) west of the sun at 1 A.M. on the 7th. About this time he may be caught by the naked eye, twinkling over the East horizon before sunrise. At 6 A.M. on the 31st he will be only 32′ north of Neptune. Venus is also a morning star, and is, of course, much more brilliant and conspicuous than Mercury. In the telescope she presents a crescent akin to that of the moon in her last quarter. Mars now souths soon, and must be looked at as soon as it is dark enough. He is, though, a comparatively insignificant object, and requires a powerful telescope to exhibit any detail on his surface. He is becoming perceptibly gibbous (*i.e.*, his periphery is less than a circle). He is in Leo (zodiacal map, plate xxv., in "The Seasons Pictured"). On the night of the 23rd he will only be some 3′ south of the star χ Leonis, shown in the map referred to. Jupiter may be seen during the whole of the amateur's ordinary working night, but should be looked at as soon as it gets dark enough. He is travelling in the direction of β Virginis (zodiacal map, plate xxv., in "The Seasons Pictured"). The Satellites of Jupiter continue to present a series of interesting phenomena to the observer. Beginning with May 1, Satellite I. will begin its transit 39 minutes after midnight. On the 3rd the egress of the same satellite will happen at 9h. 22m. P.M., followed by that of its shadow at 10h. 17m. On the 4th, Satellite II. will reappear from eclipse at 12h. 28m. 48s. P.M. On the 6th, Satellite III. will be occulted at 9h. 57m. P.M., reappearing from occultation at Jupiter's opposite limb at 12h. 55m. On the 9th, Satellite I. will be occulted at 11h. 37m. P.M. On the 10th this same satellite will begin its transit at 8h. 55m., and be followed by its shadow at 9h. 56m. The satellite will pass off Jupiter's opposite limb at 11h. 11m., and the shadow it casts at 12h. 12m. P.M. On the 11th, Satellite I. will reappear from eclipse at 9h. 18m. 58s. P.M., and Satellite II. be occulted at 10h. 14m. On the 13th, the egress of the shadow of Satellite II. will happen at 9h. 24m. P.M. On the 17th, at 10h. 37m. P.M., the same phenomenon will occur with the shadow of Satellite III. Later, Satellite I. will enter on to Jupiter's limb at 10h. 45m., as will its shadow at 11h. 51m. The egress both of satellite and shadow will not occur until the next morning. On the 18th, Satellite I. will reappear from eclipse at 11h. 13m. 30s., and Satellite II. be occulted 41 minutes after midnight. On the 20th, the ingress of the shadow of Satellite II. happens at 9h. 12m. P.M. Thirty minutes later, the satellite casting it leaves Jupiter's opposite limb, which the satellite itself does not do until 11h. 58m. On the 24th, the egress of Satellite III. takes place at 9h 58m. P.M., while Satellite III. itself actually does not enter on to Jupiter's opposite limb until 11h. 44m. Later, at 12h. 36m., Satellite I. begins its transit. On the 25th, this same satellite will be occulted at 9h. 44m. P.M. On the 26th, Satellite I. leaves the planet's face at 9h. 20m. P.M., as does its shadow at 10h. 30m. On the 27th, II. begins its transit at 9h. 21m., and is followed by its shadow at 11h. 47m. The egress of the satellite occurs at 12h. 10m. P.M. On the 29th, Satellite II. will reappear from eclipse at 9h. 36m. 53s. P.M.; while finally, on the 31st, Satellite III. will enter on to Jupiter's face at 10h. 42m. P.M. Saturn is invisible, a remark applying also to Neptune; but Uranus may be found a little to the south and just to the east of the 3-4th mag. star η Virginis (zodiacal map, xxv., "The Seasons Pictured"). The moon is new at 3h. 42·5m. A.M. on May 4, enters her first quarter at 2h. 20·1m. A.M. on the 11th, is full at 1h. 47·1m. A.M. on the 18th, and enters her last quarter at 11h. 36·1m. P.M. on the 25th. Four occultations of stars by the moon will occur at fairly convenient hours during May. The first one happens on May 6, when the 5½ mag. star 111 Tauri will disappear at the moon's dark limb at 8h. 12m. P.M., at an angle of 114° from her vertex, reappearing at her bright limb at 9h. 3m. P.M. at an angle of 324° from her vertex. At 9h. 42m. on the same evening, 117 Tauri, a star of the 6th magnitude will disappear at the dark limb of the moon, at an angle of 88° from her vertex; but she will have set ere it reappears. On the 17th, η Libræ, a 6th mag. star, will disappear at the dark limb at 10h. 16m. P.M. at a vertical angle of 64°. It will reappear at the bright limb at 11h. 32m. P.M., at an angle of 240° from the moon's vertex. Lastly, on the 21st, when the moon rises, she will have already occulted *d* Sagittarii, a 5th mag. star at her bright limb. Later on, at 10h. 57m. P.M., the star will reappear at her dark limb at an angle from her vertex of 266°. In the description which follows of the moon's path through the sky during May, the figures in parentheses refer to the zodiacal maps in "The Seasons Pictured," and will enable the student to trace her course in the heavens for himself. When our notes begin, then the moon is in Pisces (xxii.), in which constellation she remains until 3 A.M. on the 3rd, when she enters a corner of the most northerly part of Cetus. She takes nearly 12 hours to cross this, and between two and three o'clock the same afternoon passes into Aries (xxiii.). At 4 P.M., on the 4th, she quits Aries for Taurus. She is travelling through Taurus until 6 A.M. on the 7th, when she arrives on the boundary of the narrow northern strip of Orion, which she quits in turn at 6 P.M. for Gemini (xxiv.). Her passage through Gemini occupies her until 9 A.M. on the 9th, when she enters Cancer. She remains in Cancer until 9h. 30m. P.M. on the 10th, when she crosses into Leo. It takes her until 10 A.M. on the 13th to traverse Leo, and she then (xxv.) passes into Virgo. She leaves Virgo for Libra at 10h. 30m. A.M. on the 16th (xxvi.), and is travelling through Libra until 7 A.M. on the 18th, at which hour she arrives at the edge of the narrow northern strip of Scorpio. By 5 P.M. she has traversed this and passed into Ophiuchus. At noon, on the 20th, she leaves Ophiuchus for Sagittarius, as she does Sagittarius for Capricornus (xxi.) at midnight on the 22nd. Twenty-four hours later (*i.e.* at midnight on the 23rd) she crosses into Aquarius across which she is travelling until 4 A.M. on the 27th, when she returns to the constellation of Pisces (xxii.), whence she set out. Continuing her course in the sky, she, at 9 A.M. on the 30th, regains Aries (xxiii.). At midnight, on the 31st, she is on the confines of Aries and Taurus, where we leave her.

COMETS FABRY AND BARNARD.

Fabry's comet is now travelling so rapidly down into the southern hemisphere that it will soon be lost to sight in these regions. On the night of May 1 it will be N.N.W. of the 6th mag. star ξ Eridani; on

that of the 2nd due south of μ in the same constellation; on the 3rd, S.W. of Rigel in Orion's foot; on the 4th, N.W. of α Leporis; on the 5th, due west of δ Leporis, and so on. Barnard's comet too, although it is brightening, is unfortunately situated for the observer, as it is practically invisible until two or three hours after midnight, when it may be detected at a small elevation over the N.E. by N. part of the horizon. Its path commences at the point to the west and south of γ Andromedæ, shown on our map on p. 197, and trends in a south-easterly direction into Triangula. On the night of the 12th it will be due west of β Trianguläe. Hence the comet travels into Aries, and will be found N.E. of α on the 17th. On the 18th it will be N.E. of ν Arietis, and S.W. of ϵ the next night. It will be S.W. of δ Arietis on the 20th, and in the wholly blank south-eastern region of Aries on the 21st and the 22nd. The night of the 23rd finds it S. by E. of ξ Tauri, after which no indication of its path would be likely to be of any use to the observer. All the latter portion of the comet's path may be traced on Plate xxiii. of "The Seasons Pictured."

Gossip.

By Richard A. Proctor.

The *Spectator* sees only wild speculation in the idea that there was ever the slightest reference to sun-worship in the ancient Jewish ceremonial. Possibly it may seem wild to suggest even that the Jewish people or rulers knew anything about the worship of the heavenly bodies. It may surprise the writer in the *Spectator* to hear that not only at the time to which the Jewish ceremonial is referred—mistakenly or otherwise—but long after the time of David, the implements of sun-worship (so to speak) were in use in the Temple itself. My friend, "A Student of Divinity," reminds me of the passage where we are told that Josiah "commanded Hilkiah the high priest, and the priests of the second order, and the keepers of the door, to bring forth *out of the Temple of the Lord* all the vessels that were made for Baal, and the Asherah, and for all the host of heaven," and he put down "them also that burned incense unto Baal, to the sun, and to the moon, and to the planets (the twelve signs it should be, which are, however, the mansions of the planets), and to all the host of heaven. And he brought out the Asherah *from the house of the Lord*, without Jerusalem, unto the brook Kidron, and burned it," &c. The word Asherah, mistranslated "grove" in the Authorised Version, and by some regarded as more correctly to be translated "orrery," seems to have been a wooden symbol of a goddess; and being nearly always found in company with references to the worship of the sun, moon, and planets, was perhaps connected with Sabaistic observances. Some consider that the symbol related more probably to nature worship. "And he took away the horses that the kings of Judah had given to the sun, *at the entering in of the House of the Lord* . . . and he burned the chariots of the sun with fire."

* * *

The question suggests itself here, by the way, whether, in the remote time to which we have to refer the first purifying of the Jewish religion—even if we go no further back than the days of Josiah, instead of turning, as we well may, to the days of the early lawgivers—the priests could possibly have carried out the ceremonial system described in Leviticus and Numbers without using some sort of astronomical instruments. We know that Moses and others of the early guides of the people possessed astronomical knowledge. Moses was "learned in all the wisdom of the Egyptians," which included astronomy. The Egyptians and Babylonians regulated their fasts and festivals by astronomical observations; and no doubt the early Jewish teachers knew how to do astronomical work with all such accuracy as was necessary for determining their months (lunar) and passovers (annual). May not a sacred significance have come to be attached in later times to the instruments---wooden circles, quadrants, direction-bars, and so forth—which had been preserved in the Temple from those early times when they were necessary for determining times and seasons? May not the Asherah, instead of being an orrery (which is rather an absurd interpretation) have been the name given to these ancient observing instruments?

* * *

Of course, to persons ignorant of astronomy, no difficulty arises from the considerations I have here suggested. They speak and write sometimes as if they thought the high priests had "Whitaker's Almanac" to refer to, to tell them the times of new moon, of the vernal and autumnal equinoxes, and so forth. My own opinion is that Moses was *not* acquainted with "Whitaker's Almanac." This, however, may seem to the *Spectator* "a wild speculation."

* * *

This being so, those who had to carry out the Jewish ceremonial system *must* have had some astronomical knowledge, and must have made some astronomical observations, and that, too, in a systematic manner.

* * *

The *Topical Times* objects, and really with some apparent reason, that in mentioning a criticism which really appeared in that paper I did not name the *Topical Times*. I had this sufficient reason that the criticism was cut out from the *Topical Times*, and the name of the *Topical Times* was not appended to that *Topical Times* criticism. (I am trying hard to repay my obligation to the *Topical Times* for so often mentioning my name.)

* * *

The *Topical Times* asks what *is* a "cheap critic." The term is free from offence. It does not refer to the quality of the critic's mind, or the value of his opinion, but to the price paid him for his work. I know very well what cheap criticism is, for long ago I was more than once invited to supply it; and I might have supplied it, too, just as a man might break stones for a shilling a day, if I had not had more profitable employment for my time. (There is no shame in working cheaply, though there may be loss of name, for how can the public know the beggarly nature of the wage for which the poor work may have been done.) As a sample, I may mention how a wealthy firm of publishers (who have published no work of mine, let me note) once sent me a book of six hundred pages, or thereabouts, to be reviewed "in a quarter of a column" (10s. 6d. being the pay per column) "and *returned!*" If I had done that work, even if I had given good work for the half-crown, I should decidedly have been for the nonce a cheap critic.

* * *

The *Topical Times* finds my name as often in the March number as in the February number of Knowledge; but I fancy if the number of columns had been counted a considerable difference would have been found. Albeit, both the February and the March numbers included matter which had been for months in type, and had to be used before Messrs. Spottiswoode undertook the printing. I might add that the April number and the May number have both had to be got ready much earlier than of yore, and the contributors to Knowledge have not always been able to come up to time, so that I have had to supply more matter than usual.

BUT, to say the truth, I am not concerned to deny that I take and need a good deal of room in KNOWLEDGE. The number of those who are ready to work on the lines I have adopted is not great. Too many of our students of science are unable, apparently, to escape the idea that there is a loss of dignity in using plain untechnical words. I cannot get from such men the kind of writing I want. On the other hand, many students of science who are willing enough to write plainly are either not sufficiently acquainted with scientific subjects or mistake the childlike and bland for the simple and clear. They are ready to fill column after column with trivialities and inexact platitudes, under the idea that they are writing about science. Our way is strait, and there are at present very few who walk in it. Many profound thinkers there are, and many writers who possess an excellent style, but the true thinkers who will, and can, write clearly are not many.

* * *

THE *Topical Times* says, rather neatly, that I ought to take for a motto for KNOWLEDGE "*Le Savoir; c'est moi.*" Neat, not goady; for there is some truth in the suggestion that KNOWLEDGE depends a good deal on me. It was my idea to start a paper in which scientific discoveries (not mine) should be brought before those who are not specialists in science. Our monthly magazines had and have (I hope they will long have) articles such as I want to see in KNOWLEDGE. But they depend for their circulation on novels and stories, politics and poetry. The articles which make the substance of KNOWLEDGE make the padding of the monthly magazines. It may perhaps suggest itself, even to a cheap critic (in this sense that he has to review a magazine in perhaps half a dozen lines, and therefore for but a moderate sum), that in such a venture there was, and is, some degree of risk. We cannot have the support of novel-readers as the monthlies have, of scientific specialists with *Nature*, of general literature students with the *Academy* and *Athenæum*, or of mechanics with *Iron* and the *English Mechanic*. We may get readers from all those classes, but certainly we cannot expect the support of those classes as such. This being so, perhaps the *Topical Times* may find less to wonder at in the circumstance that I, who started the idea and ran all the risks, should also do a large proportion of the work. This, thought over a little, may be found to imply neither the self-sufficiency nor the want of generosity which the *Topical Times* would apparently attribute to me. If the *Topical Times* knows of anyone ready to start a magazine, supplying the same special kind, quality, and amount of material as is given monthly in KNOWLEDGE, and at the same price, I shall be very glad to hear of it. But as matters actually stand, I know that I have no occasion to defend or excuse aught in the conduct of this paper, but rather, were the truth only known, very much the other way. Hitherto, if I have supplied, as I think, a want, I have done so at a pretty heavy price. I have had to work elsewhere than in KNOWLEDGE to meet it.

* * *

AS readers of KNOWLEDGE know, I have nothing of what is commonly miscalled loyalty. I simply do not understand it, at least as a feeling to be entertained by grown men; as a child, and even for several years after childhood, I knew it well enough; and for this reason I assign the feeling to that early stage in the development of our races, of which the feelings of childhood or of boyhood bear witness. Indeed, we need only consider the requirements of savage races to see that personal "loyalty" is a useful and desirable race quality. Devotion to a chief (even though he may be of the piratical type, like Rollo the Norman or Kerdic the Saxon, from whom the royal family of England derives its title) was of old devotion to race, nay, even to family. It was essentially a duty in savage times to be ready to fight to the death for chief and ruler, even though instead of faith and fatherland that meant fighting for plunder and other folks' land. Now, matters have to some degree altered. Even if science would permit us to believe that the present inheritors of royal title inherited a trace of the fighting qualities of the old pirate chieftains, we now no longer recognise these qualities as in any way valuable or even respectable. Loyalty to one's fellow-men no longer includes special loyalty to a family or a person,—nay, the word "loyalty" so applied is absurd to those who see things as they really are.

* * *

BUT while I thus rather despise personal loyalty in all but the young or uncultured, I must confess to a strong feeling of indignation at the gross rudeness shown by many to the members of the royal family. When I read that perfectly inoffensive, nay, probably most excellent and amiable ladies, are so pursued and intruded upon by boorish and unmannerly persons, that they are prevented from taking their walks abroad as other people do, I wonder that some measures have not been taken to remedy so gross a wrong. I suppose the trouble is that women share in the offence. The summary measures which would be appropriate for boors of the masculine persuasion could hardly be applied to the females of the race.

* * *

IN another way, another lady of the royal family of England, in fact the head of the family, has recently been rather rudely treated. One can hardly view otherwise, I think, the comments made on two kindly letters written by her recently to another lady who has recently known sorrow. The publication of the letters, having had the queen's sanction, was doubtless permissible, though one rather wonders at it. But the comments made in many journals on the circumstance that such letters were written, were surely offensive to a degree. They may not have been so intended. As Philip Firmin says, there are some people who are offensive without meaning to be. But what could be more offensive than a tone implying absolute *wonder* that the queen should be a kindly woman, touched by sorrows akin to those which she has herself known in the past?

* * *

I AM glad to be bringing to a close the hardest lecturing season I have ever undertaken—or rather which has ever been arranged for me. Giving *carte blanche* to an agent to manage such lectures as could be managed, I have found considerably more lectures and travelling than I could well manage arranged for me. But I have now nearly got through the work (shall have quite got through it by the time these lines appear) and yet I remain alive! In fact at the beginning of the set of nearly 200 lectures, in last August, I was very ill, and now—thanks—I am as well as I ever remember to have been in my life.

* * *

ODD experiences come to the lecturer who lectures often enough. The other day in Ireland, after giving a carefully reasoned lecture (as I thought), only simple in being divested of technicalities, my chairman (or rather the chairman invited to preside by the committee, for *I* never want chairmen) asked me, "Er—do you know really much about astronomy?" and on my replying, with characteristic modesty, that were I to say I knew much I should show I knew little, the worthy officer (for he was a military man) proceeded, "Er—because —er—I always thought you wanted 'algebrah' for astronomy?" to which I did not reply that one also needed the alphabet in literature.

THE Belt trial closed as the last number of KNOWLEDGE was going through the press. I am not anxious to adopt the We-told-you-so style; but as I was very roundly abused by fully a hundred readers of KNOWLEDGE for pointing out, after the former Belt trial, that, let the merits of plaintiff and defendant be what they might, the principles laid down by the judge and adopted by the jury were entirely unsound, I may venture to dwell on the extreme probability now indicated in favour of the belief that the decision of the jury in the earlier trial was erroneous. For the principle at issue was an important one. An artist has, perhaps, little better power than the non-artistic public to pronounce what is great or beautiful in his own art. Had that only been asserted, no harm would have been done. The poet is often a bad judge of poetry; the painter a bad judge of pictures; and so on. But when it is a question of deciding on matters belonging to technique or execution, the opinion of one expert is worth that of a thousand who are not experts, and if all the experts called on to pronounce an opinion on such matters agree, nothing but the belief that they are dishonest should prevent men of sense from accepting their opinion as decisive.

* * *

I REGRET much that serious illness, now lasting several months, has prevented Madame de Gottrau from continuing the excellent series of papers which she had commenced on music and on art a short time since. I hope these papers may shortly be resumed. In a few weeks I shall probably have the pleasure of meeting their writer at Munich, and arranging—if her health permits—for the completion of both series.

* * *

OWING to the Easter arrangements, or misarrangements, this number had to be unusually early in the printers' hands. Odd that the passage of the sun across the equator and of the moon in her monthly cycle, moving men in ancient and semi-savage days to special astronomical observances, and so affecting the ceremonial arrangements of later days should modify the movements of our printing establishments, and the arrangements of publishing houses, in this age, which is about as free from sun-worship and moon-worship as it can well be! But when we think that because (primarily at least) the planet Saturn seemed to old star-worshippers a gloomy and melancholy god, our shops are closed now on the day which has replaced his (and on his day among our Jewish kinsfolk), scarcely any peculiarity of that kind can seem very strange.

* * *

THE University boat-race always brings out a crop of absurdities in the newspapers; but I think the last race went beyond all others in this respect. Some of the absurdities were not merely, as usual, imbecile, they were absolutely idiotic.

* * *

I REMEMBER a report of one of the finest races ever rowed for the Wingfield Sculls, which struck me at the time as the finest piece of nonsense I had ever read. The two men were well matched; they both sculled in splendid style from start to finish; and though both had done their best over the course, neither was used up at the finish, for they were both in first-rate condition. Each could certainly have sculled five miles—ten minutes after the race was over—at a pace which would have taken the heart out of any but a first-class sculler in good training. In describing this race, the reporter of a leading newspaper discovered a number of things which no oarsman would have found out. The race was won by two lengths—A., let us say, being the winner, and B. the loser—the whole race being stubbornly contested throughout. But the reporter discovered, with his penny-a-lining eye, that B.'s left arm had "given way" after the first three quarters of a mile. A little later B.'s right arm followed suit. Presently, as if the loss of both arms were not enough, B. went "all to pieces," and was "manifestly powerless." In the meantime, to be strictly fair to both parties, the reporter observed that obviously A.'s left wrist had "gone" (where he omitted to say), and the rest of the race was rowed almost wholly with the right arm—a very wonderful performance indeed, which a Casamajor or a Playford might have envied. Somehow the one-armed sculler managed to get over the $4\frac{3}{8}$ miles in splendid time, and the armless sculler, all in pieces as he was, came in but two lengths behind—and lengths are not long in a sculling match.

* * *

THE reports of the recent race are even funnier in some respects than the marvellous descriptions given in former years. The condescendingly explanatory tone employed by the experienced sportsmen who wrote them is impressive to begin with. Everyone (the *Standard* said in a leader) who knows anything about rowing will understand what such a struggle meant. It was won by Cambridge, it appears from this article, in the following unexpected way. "When the struggle of the last few moments began, the Cambridge crew, hitherto defeated (!) had gained what is called" (so kind to explain) "their second wind" (!!) "and upon the strength of that went in and won." Conceive the condition of a crew which had rowed over four miles before gaining what is called its second wind, and imagine what sort of a crew Oxford must have had to be beaten by such a lot. (I have not been in training for a quarter of a century, and am entitled to be "scant of breath" for other reasons, yet I get "what is called" my second wind in running up four or five flights of stairs, and in hard rowing for a couple of hundred yards.)

* * *

I KNOW some men, especially when out of condition, are slow in getting their second wind. I remember how a big man in our Johnian four failed to get his second wind till a mile of the one-and-a-half mile race had been rowed, and the race was lost through the difference that made. But he was not in good condition, and was constitutionally weak (though of Herculean build above the knees), and was spitting blood after the race; so that case was exceptional. Every member of a well-trained crew ought to have his second wind before the first quarter of a mile is covered. It is not a bad plan, by the way, for a crew to take a breather—running—just before the start, so as to be already working the whole lungs in the manner meant by "what is called the second wind."

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To the reporter for the *Echo*, writing after the race, it was "obvious," early, that Cambridge was by no means beaten, entirely obvious "that it was anybody's race," and "conspicuous that the Oxford men could no longer retain the advantage of the station." Yet this clear-sighted observer recognised that in the middle of the race the Cambridge crew were "all abroad,"—which the reporter might have been, for any intelligent interest he can have taken in the race.

* * *

So also the *Daily News* reporter discovered that at one part of the race the Cambridge crew were "within measurable distance of going to pieces," but were saved, and the race won at this stage, by the devotion of their stroke in picking them up and pulling them together. Mr. Pitman will appreciate the compliment, as will everyone who has ever rowed stroke in a race; for if a stroke has to steady his crew and save them from going to pieces, the chances are ten

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to one that the fault has been with the stroke himself. But the whole description is absurd on the face of it. The reporter hears a number of remarks made by persons around, whom he fondly imagines to be experienced rowing men; and, having to write as if he himself knew something about rowing, he puts in these absurdities as the results of his own experienced observation. Neither of the crews which rowed that gallant struggle on the 3rd were all abroad, or went to pieces, or were within measurable distance of accomplishing either achievement, from start to finish.

* * *

In the course of the hard-fought struggle, one or other boat, in a bit of lumpy water, takes a rather bigger roll than usual, and two or three of the oars catch the top off a wave. Then some backer of the other boat, knowing nothing of rowing, calls out, "Cambridge (or Oxford) is going all to pieces! Look how they're splashing!" On this the reporter, who very likely has not at the moment been looking at either boat, takes his pencil and writes down quickly, "Here Cambridge (or Oxford) began to show conspicuous traces of the strain which had been put upon them. It was evident to those conversant with boat racing that they were all abroad. They splashed terribly on the bow side, bow and two being particularly noticeable in this respect" ("two" is not on the bow side, but what matters?); "in the after-part of the boat they were steadier." Evidently the experienced reporter supposes the bow side to be the forward half of the boat; and people down in the country read the account, in natural wonder at the acumen of the London papers, and also at the marvellous pluck by which a crew in pieces and all abroad managed, after all, to win a closely-fought struggle.

* * *

Absolutely the funniest account of all, however, is the following in the *Yorkshire Post*:—

Not only did the Cambridge crew possess speed, but they had extraordinary stamina, and, what is more, an excellent coxswain. The way he bored the Oxford boat in the first mile, so as to give his men as much possible benefit of the tide, was a piece of steering in which he ran great risk, and again he was equally as clever through the temporary structure at Hammersmith, where the crews were nearly level. Cambridge then began to lose ground, and when daylight appeared between the boats as they reached Barnes Bridge all hope seemed to have vanished so far as the Light Blue crew were concerned. It seemed any odds, and had there been professional betting men on the steamer like we meet in sculling races I have no doubt that we should have heard extraordinary odds offered on Oxford. The reporters had finished making notes, and the artist with his instantaneous photographic machine had ceased to take further views of the contest. We had but about half a mile to go, and to the eye Cambridge were in hopeless pursuit of a crew who had in fact taken their opponent's water. But in a shorter time than it takes to tell it it was observable that Mr. Pitman's frequent calls upon the crew had reduced the gap, and quickly following upon this new life seemed to be thrown into the boat. Spurt after spurt on the part of Cambridge caused the Oxford coxswain to leave the Cantabs' water, and I shall never forget the wild and exciting yells that came forth from the steamer carrying the partisans of the Light Blue crew. A quarter of a mile from home Cambridge were again almost level with their opponents. Whether the latter had spun themselves out in trying to maintain their lead [!], or that they became scared [!!] when Mr. Pitman placed his crew in close quarters, I am unable to say, but Oxford went to pieces all of a moment [!], and in the last hundred yards Cambridge snatched the verdict out of the fire by, to use the official words of the judge, "two-thirds of a length." In every sense it was a grand race, and, as one might have expected, several of the men were very much baked by the pressure of their ever to be remembered struggle. Still, more than one waved their hands in the Cambridge crew when the gun fired, and least distressed of all was Mr. Pitman, who, in picking up his men off the Brewery at Mortlake, is recorded to have put in 21 strokes in 30 seconds. A marvellous performance! [A stroke of 42 to the minute is not *very* wonderful in a spurt; in old times 47 or 48 to the minute would often be noted, though now 42 to the minute is about as much as any good stroke would care to go to, even in the fiercest spurt. But increasing the rate of striking *would* be a rather marvellous way of "picking up" an unsteadied crew.] But this grand stroke of the winning crew, aided by Mr. Barclay at No. 7, won the race. [Poor balance of the crew! Of course they did nothing towards winning the race: Oxford being "spun out," and "scared" and "all to pieces" from that fatal "moment," Cambridge rowed in as a winning "pair oar" with six "passengers"!]

Our Whist Column.

ON THE ORIGINAL LEAD.

By Mogul.

PART II.

With the view of settling by authority the question under discussion, I drew up the following hands, with the questions at foot, and got as many opinions as I could from players whom I knew personally to be fine players, or who were so considered by those on whose judgment I could rely. The hands have been submitted to Cavendish, but I have not been favoured with his views thereon.

Hands.	Trumps, Spades.	Clubs.	Hearts.	Diamonds.
No. 1	Kg., 8	10, 9, 7, 6, 4, 2	A., Kg., Q.	Kn., 10
„ 2	9, 8	9, 8, 7, 6, 3	A., Kg., Q.	A., Kg., Q.
„ 3	5, 3, 2	10, 9, 8, 7, 6	A., Kg., Q., Kn.	Kg.
„ 4	5, 4, 3, 2	5, 4, 3, 2	A., Kg., Q.	A., Kn.
„ 5	Q., 4, 3	Kg., 6, 5, 2	Q., 7, 6, 3	Q., Kn.
„ 6	Q., 10, 9	6, 5, 4, 3, 2	Q., Kn., 10	Kn., 10
„ 7	Q., 10, 9	Kn., 8, 7, 4	10, 8, 6, 4	Kn., 9
„ 8	Kg., 6, 2	Kn., 6, 5, 4	Q. Kn., 10	Kn., 10, 9
„ 9	9, 8, 5, 4	Q., Kn., 8	Kn., 10, 2	A., Kg., Q.
„ 10	A., Q., 10, 2	Kg., Kn., 3, 2	Kg., Q., Kn.	10, 9

What card should first player lead from above hands—first, when the score is love all; and secondly, when the score is four love?

Analysis of Results showing the number of times the various Leads were recommended.

No. of Hand.	Trumps.	Clubs.	Hearts.	Diamonds.
1	—	5	25	2
2	6	2	24	—
3	—	1	31	—
4	4	1	25	2
5	—	20	—	12
6	—	8	23	1
7	—	26	—	6
8	—	12	20	—
9	12	3	—	17
10	11	9	11	1
	33	87	159	41

Total results 10 (hands) × 2 (states of score) × 16 (opinions) = 320.

Now, omitting for the present hand No. 9, in which the trumps are the longest suit and the other suits are of equal length, it will be observed that in all the other hands the Club suit is either the longest suit or, as compared with any other of equal length, the strongest; and, omitting also all cases of trump leads, there are only 84 Club leads, as compared with 183 leads of other suits. This proves that the long-suit theory is not generally adopted as a rule of faith. Taking only hands Nos. 4 to 8 inclusive, which many people will consider the most crucial, there are only 67 Club leads against 89 of other suits. In No. 4 there are only 5 leads from a four suit, as against 27 from a shorter suit. It would therefore seem that Cavendish's advice on the lead from such a hand is generally disregarded. No. 7 is the hand where the results are most opposed to my own views, there being 26 Club leads against 6 of a strengthening card; but I get my revenge in hands No. 6 and 8, there being only 20 Club leads against 44 from a suit of only three or two. Although No. 5 is also opposed to my views, I should be obstinate indeed if I did not feel that the lead from King and three

small ones is far less objectionable than a lead from Knave or Ten and three small ones.

As the above results do not include my own opinions, I hope that, having had the advantage of learning the ideas of other players, I may, without presumption, submit for criticism my own ultimate views on the various leads.

1. The chance of bringing in the long suit is so remote that it ought not to affect the original lead; the lead of the Knave of Diamonds and afterwards of the ten might be so very useful to partner that I should at the score of love all commence with the D. Knave, but at 4 love should lead out Hearts at once, as delay would increase the chance of their being trumped.

2. The chance of getting in the long suit is so good that I should commence with a trump or from long suit at score of love all, but at score of 4 love should make a rush to secure making the two tierce majors.

3. The Heart King at both scores (there is only one dissentient to this).

4. As there is no reasonable chance of winning the game, an original lead of Spades or Clubs would, in my judgment, be absolutely wrong, the Hearts should at both scores be led out in the hopes of getting some intimation from partner or adversaries. If none obtained, then lead out Ace and Knave of Diamonds, so that partner need only hold one honour and win one trick to save game.

5. I should lead the D. Queen because it may do much good, and cannot do much harm, and it would be so much better if the other suits were opened by the adversaries.

6. In this hand also the expectation of bringing in Clubs is too small to justify opening that suit. I should therefore lead Queen of Hearts or Knave of Diamonds, preferring the latter so as to better secure the opportunity on getting in with the Hearts of leading the ten of Diamonds. As this reason has not struck any other player, it may be far-fetched, but I fancy it is sound.

7. I should not like to lead from either four suit, which might terribly weaken partner without any benefit to oneself, but would try to assist him by leading Knave D.

8. This hand is very similar to No. 6, the distinction being that there is somewhat less risk in leading a Club, and somewhat more chance of making a long one, still, as only one long Club could possibly be made, the best lead at both scores would be the Queen of Hearts or Knave of Diamonds—for reasons given at trick six I should somewhat prefer the latter.

9. The strength in plain suits justifies, nay demands, a lead of trumps at the score of love all, but hardly so at the score of four love, when I should start with the Diamonds; the player with whose opinion I least like to differ would, at score of four love, play Club Queen; but, I must confess, that if I did not lead the Diamonds, I should prefer Heart Knave, and for this reason, that if anybody else opens Clubs, one is almost sure to make a trick in the suit, but the chances of doing so are diminished by opening it oneself.

10. The strength in trumps, coupled with the strength in plain suits, makes a trump lead at score of love all but imperative, but it seems to me that at score of four love the lead should be Heart King, as that offers the best chance of making one's own good cards without damage to partner, and of thus securing the odd trick. If one opened the Club suit, and partner had nothing in it, the chance of making the odd trick would be materially diminished, much more so than if Clubs opened by either adversary.

Our Chess Column.

BY "MEPHISTO."

A HARD-FOUGHT GAME.

The following game was contested in a recent handicap tournament between Messrs. Gunsberg and Fenton, the former yielding the odds of pawn and two moves. The game abounds in intricate positions and fine points. We therefore append to the game full explanations and notes, which will render this game a useful, and, let us hope, also an agreeable study.

Remove Black's KBP.

1. P to K4.	
2. P to Q4.	2. P to K Kt3.

This, we believe, is considered inferior to P to K3, but there is really no good move. Judgment is all-important in giving odds, and against a player who thoroughly knows the ordinary game it is best, even at some risk, to play an unusual opening.

3. B to Q3	3. B to Kt2
4. P to QB3	4. P to Q4
5. P to K5	5. P to B4
6. P to KR4	

Black's weak spot is on his K side. White threatens a great deal by P to R5; for if Black takes the P, the Q checks, and disarranges Black's position considerably. If Black does not take, then White exchanges his RP for Black's KtP, and we do not see how Black can defend it. If Black plays P to K3 with a view to protecting his P, then 7. P to R5. Kt to K2; 8. B to KKt5, &c.; besides, P to K3 shuts in Black's QB.

6. P × P

7. P × P

This is safe, and unobjectionable. White might, however, have got a considerable attack by playing 7. P to R5 at once, supposing P × BP. 8. Kt × P or P × KtP, &c.

7. Q to Kt3

8. Kt to QB3

This also is reasonable, for the Kt attacks the Black QP. White, however, receives odds, which should induce him to play with energy, for with every move Black gains time for development. 8. P to R5 would have been difficult to meet. If Black's P becomes isolated, he will fall very soon. 8. Kt to QB3, however, seems a very good move, as apparently Black cannot defend the QP by the B without cutting off his Q from defending the P on Kt3. P to Q3 would not do at all on account of both P to R5 or Kt to Kt5.

8. Kt to QB3

It is of paramount importance not to be restricted to mere defending moves. Black hereby gains time at a critical moment in the opening. The complication of a manœuvre helps towards its success, a fact which must never be lost sight of by a player giving odds. Kt to QB3 was a perfectly sound move. If White plays 9. Kt × QP, Q to R5 (ch). 10. Kt to B3, Kt × QP. 11. B × P (ch), P × B. 12. Q × Kt, B × P, and Black has got rid of his difficulties, although he has not gained anything.

9. KKt to K2	9. B to Q3
10. P to R5	10. P × P

Again straining a point in order to develop his game, Black could also have defended his KtP by B to B2, but then follows 11. P × P with a strong game.

11. R × P	11. Castles

The only other alternative was P to KR3. 12. B. to Kt6 (ch), K to Q2. Black, in giving up the RP, also had certain faint hopes of attack on his R's file, hopes which soon assumed a real form.

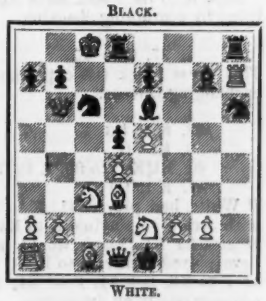
12. R × P

After 12. B × P, White was needlessly afraid of his B remaining pinned.

12. Kt to R3 !

A very bold bid on the part of Black to take advantage of his development to create complications, and at the same time a perfectly sound move. If 13. R × B, Kt to B4. 14. B × Kt, R to R8 (ch), winning the Q. Again, in reply to 13. R × R, R × R. 14. B to K3, Kt to KKt5. 15. Kt to Kt3, Black can play Kt × QP, or against other moves in this interesting position some attack will always result for Black. Finally, if 13. B × Kt, B × B, Black again has a good game.

BLACK.



WHITE.

13. Q to Kt3.

No doubt the best reply, as now the command of the R file is of less advantage to Black.

13. Kt to QKt5

14. B to Kt sq.

This seems preferable to R × B. A very ingenious defence, involving the temporary sacrifice of a piece, was pointed out to us, as follows: 14. Kt to R4, Kt × B (ch). 15. Q × Kt, Q to R4 (ch). 16. B to Q2 ! Q × Kt. 17. R × R, R × R. 18. Q to Kt6, with a good game.

14. Kt to KB4

It was an open question whether this move or R × R should have been played first; perhaps the latter.

15. R × R	15. R × R
16. B to K3	

B × Kt would give Black command of the square on QB7.

16. Kt × B

17. P × Kt	17. B × P !

At last the tactical advantages have turned into something substantial, and Black has one P back. Should White play 18. P × B, then Black plays Q × P ! and White is threatened with the mate by R to R8.

18. K to K2	18. B to Q3
19. P to R3	19. Q to R4

Of course White can force the exchange of Queens by 20. Q to R4. Black was, however, quite right in giving himself another chance of avoiding the exchange, which would necessarily have followed on his moving the Kt.

20. B to R2.

This is weak, and again gives Black a tactical advantage. White had a fine move at his disposal in 20. B to K4; he thereby effectually defends his weak K Kt P, as Black cannot well take the B.

	20. Kt × B
21. Q × Kt	21. R to Kt sq
22. P to Kt3	

White cannot defend this P, for if 22. R to KKt sq, B to R7, he therefore aims at effecting exchanges.

	22. B × P
23. R to KKt sq	23. B to Q3
24. R × R	24. B × R
25. P to Kt4	25. Q to R3
26. P to Kt5	26. Q to R4
27. P to K4	

White wants to exchange as many Pawns as possible; Black tries to retain his two Bishops, which, as will be seen from the following ending, are of great power. 27. P to R4 was White's best.

	27. B × P
28. P × P	28. Q to Kt5

limiting the action of the White Q if 29. Q to B2, B × P

29. K to K3

To release the Kt,

	29. B to R2.

Still preventing the Queen from coming into play *viâ* B2.

30. P to K6.

White has throughout this game shown superior steadiness and judgment. Seeing that he slowly loses ground he gives up two Pawns in succession for the chance of bringing his Queen and Knights into the game, and getting possibly drawing chances.

	30. Q × P
31. Q to B4 (ch)	31. K to Q2
32. P to Kt6	

White's hold is the position of the B on R6 and Q to R4 (ch) if P × P Black's Pawns become weak, although we think Black should win, yet it is difficult to decide, if a draw is undesirable.

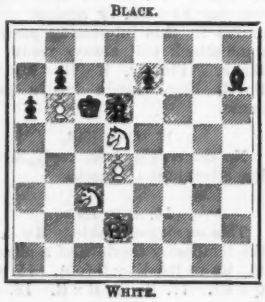
	33. P to R3
34. Q to R4 (ch)	34. K to Q sq
35. Q to R5	35. Q to R3 (ch)
36. K to B3	

Here K to B2 would have been better. Black cannot do anything by continuing checking.

	36. B to Q3
37. Q to Q5	

This gives Black the opportunity of getting a winning ending by exchanging Queens.

	37. Q to R8 (ch)
38. K to K3	38. Q × Q
39. Kt × Q	39. K to Q2
40. Kt(K2) to B3, K to B3	
41. K to Q2	



If White had played 41. K to B3 with a view to playing K to K4 if B attacks Kt, Black would not have played either B to K Kt sq. or P to K3, but 41. P to R4, the advance becoming dangerous.

	B to K Kt sq.
42. Kt to K3	K × P
43. K to B2	P to R4
44. K to Kt2	K to B3
45. Kt to K4	B to B5

This is weak and loses a good deal of Black's advantage. He might safely have advanced his P to Kt4 or played B to B2.

46. Kt to K B5

The correct move, and wins a P; for if K to Q2, then 47. Kt to B5 (ch), &c.

	46. K to Q4
47. Kt to B5	47. P to Kt4

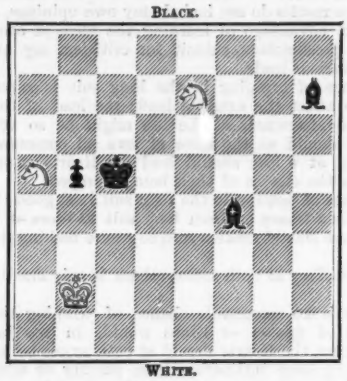
Of course, if Kt × P (ch), K × P, and the Kt remains attacked.

48. Kt to QKt7	48. B to R2

The idea being to cut off the Kt if possible. Black had, however, a better reply in B to Kt4, for then, if 49. Kt × RP, P to K3, and Black will win the QP and have two Pawns clear.

49. Kt × KP (ch)	49. K × P
50. Kt × P	50. K to B4

In this position the game was adjourned after six hours' play, the position forming a useful end-game study.



51. Kt to Kt3 (ch).

It seems natural for White to endeavour to retreat his Kts for the better protection of his K. It may be, however, that Kt to Kt7 (ch) would have made winning a little more difficult. The end-game is rather interesting, as showing the great strength of two Bishops. We believe that Black can win whatever White does.

	51. K to Q3
52. Kt to B8 (ch)	52. K to Q2
53. Kt to R7	

53. Kt to Kt6 (ch) is more plausible.

	53. B to K4 (ch)

A very important manœuvre. Black intends to advance his P to Kt5, so as to further limit the movements of the Kt after Kt to Kt4. Black must advance the P as he cannot play B to Q6 on account of Kt to B5 (ch).

54. K to R3.	54. B to Q3 (ch)

A welcome check, which prevents Kt to B5.

55. K to Kt2	55. P to Kt5
56. Kt to Kt4	56. B to K4 (ch)
57. Kt(Kt3) to Q4	

This looks best, for it not only gives the White K more room, but the Kt also cuts off the Black K entirely.

	57. B to KKt sq!
58. K to B2	58. B to QB5
59. K to Q2	

This is surrendering to the enemy. A good fight would result if White had played 59. Kt to KB3; probably P to Kt6 (ch); 60. K to Q sq, B to B5; 61. Kt to B3, B to Q6; 62. Kt to Q2, P to Kt7; 63. Kt to Kt sq; and Black must advance with his K.

	59. B × Kt(Kt5)
60. Kt × B	60. K to B3
61. Kt to R7 (ch)	61. K to Kt2
62. Kt to Kt4	62. K to Kt3

Resigns.

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